ILLUSTRATED
# ELECTRICAL REVIEW
A Journal of Scientific and Electrical Progress.

VOL. 27. No. 19. WEEKLY. | NEW YORK, WEDNESDAY, NOVEMBER 6, 1895. | $3 per Annum. Single Copies, 10 Cents.

Copyright, 1895, by Electrical Review Publishing Company, 13 Park Row, New York.

Entered at Post Office, New York, as Mail Matter of the Second Class.

## VIEWS, NEWS AND INTERVIEWS.

The Supreme Court of South Dakota has decided that the Western Union Telegraph Company is not compelled to accept a message for transmission unless it is written on the company's blanks. The decision was rendered in a test case from Sioux Falls.

According to a press dispatch from Oshkosh, Wis., a novel wedding will soon take place at the Northwestern Depot in Oshkosh and St. Cloud. The bride will be Miss Lydie Kluth, of Oshkosh, and the bridegroom, Duncan Edwards, agent of the road at St. Cloud. They will be married by telegraph. The usual questions will be asked the gentleman over the wire, and his answer, made before witnesses, will be returned. The bride will, of course, reply to the minister in person. She will then take a wedding tour to her husband's home by herself. The reason for such an unusual proceeding is the absence of any Protestant minister at St. Cloud, and the bridegroom cannot come to Oshkosh.

It is reported that about 200 railway carriages are now lighted by electricity in Sweden, and in Denmark the same system is also in use on the better trains.

Mangles & Schmidt, of Newark, N. J., have an immense bread bakery, and, according to a daily contemporary, run 50 delivery wagons in the several counties within 15 miles of the big bakery at the corner of Hunterdon street and Fifteenth avenue, Newark. Eighteen of these wagons are sent to Jersey City every morning, loaded to their full capacity with hot bread, which is delivered to the locked boxes in front of grocery stores before the stores are open. To save a drive of from 14 to 20 miles a day for each of these wagons, the firm has made a contract with the Consolidated Traction Company to run trolley freight cars from the interior of the bakery to a new delivery depot now being erected in Jersey City, where there will be extensive stables and wagon sheds. The cars will be run at an hour of the night when they will be unobstructed, and will not interfere in any way with passenger traffic. If the venture is successful, the bakery firm will probably run cars to Elizabeth and Paterson, and it is hinted that the traction company will look for similar contracts with brewers in Newark, who now deliver large quantities of beer in Hudson County and this city by wagons. The freight business by trolley is strongly opposed in Newark, but it is asserted that under the franchise the company has the right to run freight cars. The trouble will come when the company attempts to put in freight spurs or sidings. City Counsel Riker has been asked by the Board of Works to give a decision as to the right of the company to run freight cars and express cars.

A special correspondent found himself shut out of a London newspaper office in Fleet street and unable to make himself heard by any one within. His errand would not wait till morning. What should he do? He went to the central telegraph station and telegraphed to a newspaper office in Ireland asking the clerk there to telegraph to the clerk in Fleet street to come down stairs and let him—the correspondent—in.

For the first time direct telegraph communication was made one day last week between New York city and Pike's Peak on the occasion of a visit to the Peak by Gen. Thomas T. Eckert, president, and Col. R. C. Clowry, general superintendent of the Western Union Telegraph Company, and a party of friends. A direct circuit was made up so that General Eckert and Colonel Clowry could talk with a number of directors of the telegraph company who were in the Western Union building at the time. The line worked admirably.

Fig. 1.—An Artistic Column Arc Lamp.

The search-light has recently been put to a rather suggestive use at Stalybridge, at Messrs. Gartside's works, where there is a strike, in connection with which rioting has taken place, says a London exchange. The light has been used "with the idea of preventing the striker from maliciously setting fire to the temporary sheds erected for the protection of the men at present employed." It is now being used nightly, in conjunction with the police force established at the works, to search the surrounding country and to illuminate the various parts where pickets are placed. It is said that the arrangement enables the services of a number of policemen to be dispensed with.

Russian scientists, after an investigation, report that of 597 trees struck by lightning in the forests near Moscow 302 were white poplar. Farmers are advised to plant poplars as natural lightning conductors.

To make pure chloroform by means of electrolysis a constant current is passed through a salt solution in an enameled vessel by means of lead electrodes. This liberates chlorine, which reacts on a stream of acetone diffused into the vessel, and the chloroform produced is thus collected by distillation.

In the case of Griffin *vs.* the United Electric Light Company, of Springfield, Mass., the court holds that an electric light company is liable in damages to persons injured by their wires in cases where the person injured had a right to be where he was when injured.

In putting their wires underground the Boston Electric Light Company has already expended $300,000, and estimates that the entire cost of doing this will be $900,000.

## SOME NEW DESIGNS IN INCANDESCENT ARC LAMPS.

ARTISTIC NOVELTIES FOR ALTERNATING AND DIRECT CURRENTS.

The International Arc Lamp Company, whose offices and salesrooms are at Mercer and Houston streets, New York city, have just completed and placed upon the market a line of incandescent arc lamps which includes several novelties in design and construction. One of these, a column arc lamp for direct current, is illustrated on this page and on the page following are shown an artistic torch lamp bracket and a neat design of alternating-current lamp.

The International company have spent considerable time and money in developing the lamps they now offer to the trade and the public, and they believe they have evolved a product which will meet with ready favor. Mr. G. R. MacIntire is entitled to the credit for the production of these lamps, and he, naturally, is enthusiastic on the subject of their merits. Mr. E. P. Gleason, of the well-known E. P. Gleason Manufacturing Company, of New York city, is prominently connected with the new company, and it may be assumed that the company, under his guidance, will intelligently push the sale of their goods.

In Fig. 1, on this page, is shown one of a pair of handsome column arc lamps for direct current, especially designed for use at the doorway of a well-known Twenty-third street restaurant. The prominent features of this lamp are its graceful design, ease of access to the working parts, entire absence of shadow from supporting rods and the novel feeding mechanism adopted. The operating parts are all placed below the heat line. In operation, the carbon is fed from below upward with the result that the light zone is constantly increased as the life of the carbons decreases until the final consumption of the carbon. The design of this lamp may be varied to suit any architectural condition for interior work and when used, as in this case, for exterior

illumination, the unsightly effect of frame work necessary with pendant lamps is entirely done away with. The method of feeding adopted in this lamp permits of wide variation in the general design.

The bracket, or torch, lamp shown in Fig. 3 illustrates one of these variations. The feeding mechanism here employed is similar to that used in the column lamp. The general design of the bracket can, of course, be made to harmonize with the desired surrounding decorative features.

One type of the alternating current incandescent arc lamp made by the International company is shown in Fig. 2. The chief claims made for this lamp by the manufacturers are that its qualities of brilliancy, silence and economy are of the highest order. The length of the shortest alternating current lamp made by this company is 12 inches from the top of the lamp to the bottom of the glass globe. The company also make a 16-inch "boudoir" arc lamp for a consumption of two amperes of current. They make special claims for the efficiency of their focusing lamps which, at the same voltage and amperage, give a life to the carbon of 12¼ hours as against 11 hours with other lamps of a similar type.

In general it may be said that these lamps have been subjected to a variety of unusual and severe tests in foundries, machine shops and store illumination, all of which they have successfully met. The results of tests on carbon consumption are reported to show that in the use of these lamps there is but 19 grains of carbon dust deposited in the globe after burning three and one-half ounces of carbon.

The International Arc Lamp Company seem to be fully alive to the possibilities of development, artistically and commercially, contained in the arc lamp, and they are making every effort to put their product on the market in an efficient and attractive manner.

### ELECTRIC LIGHT FLASHES.

The cost of lighting Portmouth's, N. H., streets this year will be $18,000.

A fire at Heyworth, Ill., on October 23 destroyed Dumphrey's grain elevator and electric light plant. Loss, $40,000.

The Syracuse, N. Y., Heat and Power Company has elected the following officers: President, William K. Pierce; vice-president, S. B. Hahn; secretary and treasurer, Theodore A. Foster.

The Ellsworth City, Me., government is having a controversy with the electric light company regarding street lights, and there is talk of a new company which will furnish 30 lights for the price now paid for 18.

The steel structural work and masonry on the new Union avenue electric light plant at Altoona, Pa., is rapidly approaching completion. The great iron stack has been finished and the work of painting it has been begun.

At the annual meeting of the Citizens' Light and Power Company, of Rochester, N. Y., the following directors were elected: H. W. Davis, S. G. Hollister, R. M. Myers, J. W. Gillis, E. M. Higgins, E. W. Peck, W. C. Barry, Joseph D. Casey, H. C. Brewster, Henry Willis, P. J. Coggswell, H. D. Stone, P. V. Crittenden.

Some of the business men of Holyoke, Mass., have started a discussion for a new system of arranging and granting the electric lights in the city. It is thought that too many electric lights have been placed in

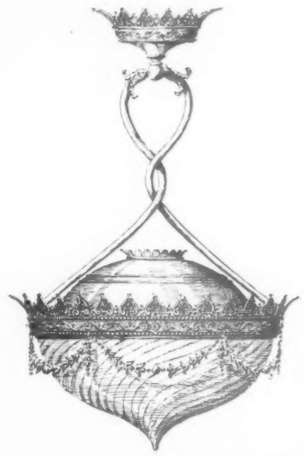


FIG. 2.—INTERNATIONAL ALTERNATING CURRENT ARC LAMP.

some localities when a smaller number of lights would have answered the same purpose at a less expense to the city.

The Hempstead, L. I., Electric Light and Power Company has applied to the board of trustees, of Rockville Center, for a franchise for electric lighting privileges. The company is little known. It is represented by Arturo Garcia & Company, of New York, South American commission merchants and brokers, who have also applied to the trustees of Freeport village for a similar privilege.

The Aberdeen, Wash., electric light plant has been leased to the firm of Benn & Green (E. B. Benn and C. R. Green) for a period of one year, with the option of two years, commencing immediately, at a rental of $1,400 per annum. Benn & Green will extend the lines more generally over the town and promise an all-night service instead of the 1 o'clock service which has been given by the company for some time past.

The Jamestown, N. Y., Common Council has recommended that improvements to the extent of $6,000 be made at the municipal electric lighting plant for the purpose of further increasing the incandescent part of the plant for commercial lighting. According to the report of the board, this amount would give 2,000 additional 16 candle-power incandescent lights, which would produce a gross income to the city of $14,400 per annum. The additional cost of operating the plant would only be $4,400, giving a net revenue to the city of $10,000 per annum.

## TELEPHONE NEWS AND COMMENT.

The Southern Massachusetts Telephone Company will erect a new $4,000 building at Taunton, Mass.

The New England Telephone and Telegraph Company will soon sell to bankers $150,000 more of its five per cent 20-year construction bonds.

The Phœnix Interior Telephone Company, of No. 131 Liberty street, N. Y., has gone to law to get $1,500 from the Standard Telephone Company, which has offices in the Postal Telegraph Building.

A telephone war has begun in Sheboygan, Wis. The Common Council passed a resolution refusing permission to the Wisconsin Telephone Company to erect poles until obtaining a franchise.

The output of the American Bell Telephone Company for the month ended October 20 was as follows:

| | 1895 | 1894 | Increase |
|---|---|---|---|
| Gross output | 14,969 | 8,828 | 6,141 |
| Returned | 6,305 | 5,482 | 823 |
| Net output | 8,664 | 3,346 | 5,318 |
| Since December 20: | | | |
| | 1894-5 | 1893-4 | Increase |
| Gross output | 143,192 | 71,206 | 71,986 |
| Returned | 67,815 | 59,128 | 8,687 |
| Net output | 75,377 | 12,079 | 63,298 |
| Total outstanding | 657,883 | 578,569 | 79,314 |

There is a telephone rate war on in Waterloo, Iowa, between the Iowa Union and Cedar Valley Telephone Companies, and as a result telephones may now be had for one dollar a month. This is the rate announced recently by the old Iowa Union Bell people. The new company has not yet met it.

The People's Telephone Company, of Homesdale, Pa., has put in about

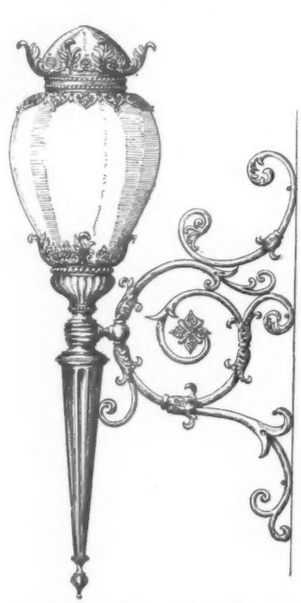


FIG. 3.—INTERNATIONAL TORCH ARC LAMP.

a dozen telephones and are getting ready to locate many more. In a short time the new company will submit a proposal to put alarm boxes in the homes of all firemen residents in the borough. The boxes will be operated from the Central telephone office, which will be open all night.

The officers of the Chesapeake & Potomac Telephone Company, of Rockville, Va., have made application to the Mayor and Council for permission to erect poles and string wires from the southeastern limits of the town to the Montgomery Hotel. This arrangement will give the town telephonic communication with Washington, something that has been long needed.

Weather Observer Marbury, in charge of the weather bureau in New York city, is considering several plans for the increase of the usefulness of the weather service to the people in general. He has been conferring with the officers of the Chesapeake & Potomac Telephone Company relative to an arrangement he desires to make, which will be a benefit to all the subscribers of the company.

The purchaser of the 5,849 shares of American Bell Telephone Company's stock, sold on October 30 at auction by order of the directors, was Edgerly & Crocker at 196. Blake Bros. & Company for whom the lot was purchased have always been large holders of and great believers in the stock. A few shares may be resold, but the major part of the lot has gone into an investment account.

A motion to dismiss the appeal of the United States from the judgment of the Court of Appeals of the First Circuit in the Berliner telephone patent case was submitted in the Supreme Court of the United States on October 28 by the American Bell Telephone Company, assignee of the patents involved. The ground upon which the motion is based is that the proceeding, being one arising under the patent laws of the United States, the judgment of the Court of Appeals sustaining the patent is final. The court adjourned on November 1 until November 11.

An important decision concerning the rights of property owners in the matter of the placing of telephone or telegraph poles on highways was given at Danbury, Conn., by Judge Curtis, of the Fairfield County Common Pleas Court. The case was that of H. Thomas *vs.* the Southern New England Telephone Company for $200 damages for removing a pole from the street to the sidewalk in front of the premises of Thomas. Judge Curtis, in his opinion, held that the permission given to telegraph and telephone companies to maintain their poles and wires on the highway by the general statutes has no effect as against the owner of abutting property and is only operative in preventing such erection from being a public nuisance. Abutting owners own the land to the center of the highway. Judge Curtis further held that the company has no right to move a pole two feet farther in on the premises without the consent of the owner, and that the defendant is a trespasser.

## THE ELECTRICAL INDUSTRIES OF NEW YORK STATE.

A SUMMARY OF THE LONG DELAYED CENSUS.

The census bureau at Washington has at last made its final round up of the statistics covering the electrical industries in the State of New York. These have been prepared by Mr. Allen R. Foote and are very complete and explicit.

The first electric street railway in the State of New York commenced operation during the year ending June 30, 1886, since which date, to June 30, 1890, there were 10 roads electrically equipped, making 11 in all, installed as follows: One road in 1886, two roads in 1887, one road in 1888, four roads in 1889, three roads in 1890. Of the total number nine originally used horses for motive power and two are original electric roads. The advantage of the adoption of electric motive power may be inferred from the fact that nine companies, in reply to a special inquiry, report an increase of 69 per cent in the number of passengers carried in the year immediately following the adoption of such motive power in lieu of horses.

There are five cities in the State of New York reporting the use of police telegraph service, and 36 cities report the use of fire alarm telegraph service.

The use of electric welding is reported October 1, 1895. A company installed one electric welder of 20,000 watts capacity. This welder is used for welding fifth wheels for heavy wagons. The methods superseded by electric welding was forge welding. The owners of the establishment certify that an electric weld for this work can be made in 10 minutes, whereas the time required for making a similar weld by forge welding was 45 minutes; that the saving in expense is about 38 cents per weld, after paying 10 cents per weld royalty, over the expense of forge welding. The cost and present value (1890) of the welder is stated to be $2,000.

The first electric smelting company commenced business in 1887. The cost of the works, including $21,000 for land and power site, was $90,000; the cost of additions since made was $50,000, making the total cost of the works $140,000. From this cost $15,000 is deducted, making the present value of the works as given (1890) $125,000. The power plant consists of one steam engine, 1,000 horse-power capacity, and four horizontal water-wheels of 500, 480, 50 and 200 horse-power, respectively, using head water averaging 34 feet. The electric plant for smelting consists of four dynamos, continuous current, constant voltage, variable amperage, of the following capacities: Three dynamos of 70 volts, 3,000 amperes, 210,000 watts each, and one dynamo of 50 volts, 1,200 amperes, 60,000 watts; also one dynamo of 500 volts, 6.8 amperes, 3,400 watts, used for lighting purposes. The total capacity of the dynamos used for smelting purposes is 69,000 watts. The raw material used is aluminum, silica, manganese, copper and iron ores, partly imported from Germany and partly from Southern States of the United States. The quantity of raw material handled is about 2,000 pounds per day. Electricity is used for heat only. The anode and the cathode are composed of carbon and metal and other materials. The crucibles are connected in series varying in number from six to eight. The whole number of crucibles used varies from two to 20. The products are aluminum and alloys, and the alloys of silicon and manganese. The quantity of refined metal produced per day is 1,500 pounds.

Two central electric light and power stations have auxiliary plants of storage batteries, viz.: Cooperstown has 56 cells used in series on a continuous current incandescent circuit in the early morning and during the day, when the load is light. The maximum load is stated as 35 amperes, and a 110-volt current is used for charging.

Waterloo uses 126 cells in series on a three-wire continuous current incandescent system; the maximum load is 30 amperes, and the total capacity of the battery is 300-ampere hours. The voltage of charging current is 132.

Under the head of isolated electric lighting plants it is stated that the number of accumulator cells in use in the city of New York is 531, in the State of New York, outside of the city, 422, and for the State of New York as a whole, 953. The number of incandescent lamps connected directly to accumulators is shown to be for the city of New York, 911; for the State of New York, outside of the city, 445; and for the State of New York as a whole, 1,356.

The total mileage of streets over which electric cars are operated is 89.23. The gauge of track is uniformly four feet eight and one-half inches, or "standard gauge."

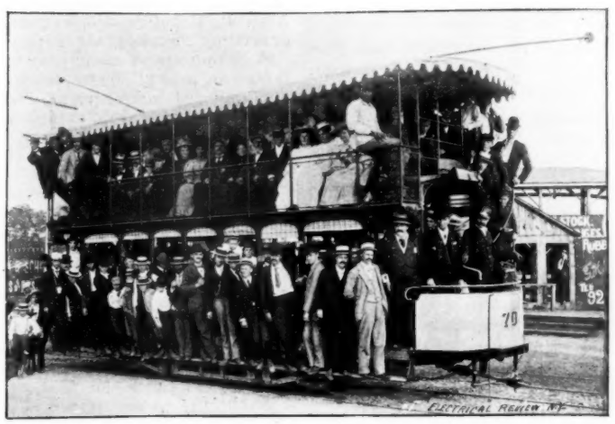
---

President Flynn, of the Nassau Electric Railway Company, of Brooklyn, N. Y., denies that he has entered into an agreement to acquire Manhattan Beach property.

### One Hundred and Seventy-five Passengers on One Car.

The accompanying illustration shows a double-decked car, operated by the Terre Haute, Ind., Electric Railway Company, carrying 175 passengers. There are 75 people on the stairways and upper deck. It was the last car leaving the ball grounds one day during the past Summer, which partly explains the unusual number of passengers carried. This car is equipped with two of the Walker Manufacturing Company's 30 horse-power motors mounted on a standard truck. In two months, not operating any full day, it carried 30,000 people.

The car, which the illustration shows to be a double deck open one, was designed by Mr. Russell B. Harrison, president of the company. It was used part of the time for trolley parties, the guests occupying the upper deck and the musicians the lower part of the car.



TERRE HAUTE, IND., ELECTRIC RAILWAY COMPANY'S DOUBLE DECK OPEN CAR, WITH 175 PASSENGERS ABOARD.

---

### PERSONAL.

It is rumored that the council of the Institution of Electrical Engineers will recommend Sir David Salomons for president.

Gen. T. T. Eckert, president of the Western Union Telegraph Company, is making a tour of the West and reports a considerable revival of business in general.

The many friends of Mr. W. D. Sargent, general manager of the New York & New Jersey Telephone Company, of Brooklyn, N. Y., will be pleased to learn that he is rapidly convalescing from a recent severe illness.

---

### What Does This Refer To?

In a brief account of the fatal accident to Franklin L. Pope, the London *Electrical Engineer* for October 18 says:

* * * The time has not yet come—and will not for many years, if ever, come—when the writer can divulge a certain historic incident in which his late friend (Mr. Pope) played a most prominent part. The incident carried alarm and dismay to certain patentees and financiers across the Atlantic, and rendered forever impossible any harmonious working between these people and the writer. * * *

### A Double Electrocution.

Two murderers were electrocuted within a few minutes of each other at Clinton Prison, Dannemora, N. Y., on October 29. George H. Smith was placed in the chair at 11.30 A. M. A current of 1,750 volts was turned on for five seconds, then reduced and continued for 20 seconds, again increased for five seconds and then reduced and left on for 20 seconds. Smith was pronounced dead at 11.44 o'clock.

Charles N. Davis was strapped in the chair at 11.59 A. M. A current of 1,780 volts was sent through his body. The high voltage was continued for six seconds, reduced and kept on for 30 seconds; then it went back to 1,780 for five seconds, and was reduced and kept on for 20 seconds. It was just 12.01 P. M. when he was pronounced dead.

The entire time consumed from the moment Smith entered the chamber until both were on the tables ready for the autopsy by the physicians was 22 minutes. The autopsy, it is reported, revealed nothing unusual in the make up of either man.

---

### Westinghouse Electric and Manufacturing Company.

A recent dispatch from Philadelphia to the Boston News Bureau says:

It was learned at the Baldwin Locomotive Works that Mr. Westinghouse believes that under patents controlled by his company the electrical current can be conveyed to the motor without the use of a trolley wire, a conductor or a slot. He also believes it to be not only practicable, but economical, to operate long lines by electricity. An alternating current of high voltage would be used for distribution, which would be converted into a continuous current for operating the motors. This in itself would not secure economy over steam, but Mr. Westinghouse is satisfied that he can produce electricity at one-sixth the present cost of production. If this is practicable, electric power will supersede all other power for most purposes. Mr. Westinghouse expects to make his method public, it was stated, within a few months.

---

### Sterilizing Milk by Electricity.

TO THE EDITOR OF ELECTRICAL REVIEW:

We understand that electricity is being used in this State for sterilizing milk; we are anxious to find out some of the particulars and we will deem it a great favor if you can in any way help us to get this desired information. Awaiting an early reply, we remain,

Yours very truly,

COLUMBIAN MFG. CO.

Binghamton, N. Y., Oct. 28, 1895.

---

The first electric locomotive will shortly be received at the Westinghouse Company's East Pittsburgh works from the Baldwin Locomotive Works, and underground apparatus of sufficient capacity for its operation in hauling heavy trains is being installed to further demonstrate the feasibility of the "button" system for the operation of switching engines in freight yards of standard railways.

## REPORT OF THE COMMITTEE ON PATENTS.

PRESENTED TO THE AMERICAN STREET RAILWAY ASSOCIATION, MONTREAL, OCTOBER 16, 1895.

Gentlemen: Among the many perplexing problems that have demanded the attention of some of our western street railways is the question of "worthless patents," and it being evident to several gentlemen of the street railway fraternity that an association to handle all matters pertaining to patents as affecting street railways would be highly beneficial to all concerned, a committee was appointed at Atlanta to take up the matter and submit a plan of organization.

This committee, working upon the lines suggested, have investigated the matter, as far as it has been within their power, looking up facts and matters pertaining thereto, and desire to submit to you the following report for your careful consideration.

The majority of street railways have, at one time or another in their history, been sued for using or making some device which was an alleged infringement on some patent. These cases were either fought out in the courts or settled by the railway company, rather than go to the expense of court costs and attorney's fees. A large proportion of railways have paid and are now paying royalties, either directly to the patentee or indirectly to the manufacturer (the royalty in the latter case being included in the price of the article paid by the purchaser), on certain articles in use on their systems. These direct royalties are often paid when exacted, to avoid going to the expense of hiring an attorney to look up the patent papers to see if the claimant has a good patent and a valid claim to his royalty. The writer knows this to be the case with the company with which he is connected. The expense of investigating such matters is often more than the amount involved, hence the matter is settled upon the payment of a few hundred dollars. The manufacturer should stand the burden of infringement suits and not the purchaser, and the advantage of an association of this kind would be to influence or compel the claimant to direct his suits against the manufacturer and not the railways. Since the adoption of electricity as a motive power we find that the number of patented articles in use on street railways has increased wonderfully. We are confident that a large number of these patents are worthless and will not "hold water."

Were these alleged patents to be investigated, a great number would become common property, on account of the patent feature becoming eliminated, and hence the patentee would be deprived of his royalty, and the manufacturer would at once reduce his price in consequence. We do not mean to say that the honest inventor is not entitled to his royalty, provided he has a good bona fide invention. It is clearly evident that if the street railway companies were combined together in an association of this character, that the expense to each would be small, while the advantages will be manifold. Another important item will be the assistance of the association in advising its members concerning new inventions of their own employés, whether said articles are patentable, or whether infringements on other inventions. Said assistance to be furnished free to said railway companies which are members of the association. This will serve to encourage employés to work out improvements in devices in use on street railways and protect them in their rights. The advantage to the company presenting such new invention will be that they will be permitted to use said device free of royalty.

A great many devices in use on our system are common property at the present time from the fact that the patent has expired, yet how many members of this association know the expiration of the patent limit on a single device in use on their road, and in ignorance of such facts are still paying the same old price.

The idea of such an organization of this kind was prompted by the fact that two similar ones have been in existence for over 24 years for the benefit of the steam railroads, and have been highly successful in every detail. One of these associations is located in the East and the other is located at Chicago, and the two include as members all the important railroads in the country and a large number of the smaller roads.

The object of the Western Railroad Association, as stated in its by-laws (from which I quote) is as follows: "The object of this association is the investigation of all patents and improvements affecting the interests of railroad companies, members hereof, and their mutual protection against the unjust and unreasonable claims and demands of patentees and their representatives, and the procuring of other information which may appear to be of value to the association."

We have had several conferences with the general counsel of this association and he has been very kind in giving us information regarding the workings of his association. He also declared that an association of like nature for street railways will be highly beneficial to all concerned and recommended it. I have with me a copy of their constitution and by-laws, also a copy of their annual report for the year 1894, which is worthy of inspection and a valuable guide to the street railway interests.

This association is maintained by an annual assessment of its members based on the gross earnings of the several railroads, payable in quarterly instalments. The expenses of the association consist of the salary of an attorney, office help, rent, traveling expenses, court expenses, patent office books, pamphlets, etc., and is conducted on a more expensive scale than would be necessary in a like organization for street railways. For instance, in the beginning our association might not feel like hiring an attorney to give his entire time, but only pay him for actual work on fixed rates. The expenses for the first year would, of course, be larger in proportion than the following.

The Western Railroad Association has won about four-fifths of its suits and stands all expenses connected with said suits, but does not, of course, pay any judgments; the defendant road paying any judgment that may be entered against it. The entire membership, however, obtains the benefit of all such trials. The work performed by the Western Railroad Association in 1894, if done through the regular channels by the roads themselves, would have cost about 10 times as much as was paid to the association during the year for same. It is the practice of the roads belonging to the association not to put on any new device without first referring same to the association for advice. The number of suits against the railroads have been reduced very materially since this association was started, and $60,000,000 in judgments were defeated in one year. One of the large trunk lines paid $10,000 for using a patented article that was afterwards found to be worthless as far as the patent feature was concerned. Since then they refer all such matters to the Western Railroad Association before adopting devices or settling claims of this character.

A certain street railway, so we are informed, paid $1,500 to prevent suit on an alleged infringement, and the patent was worthless, as was afterwards learned. This might have been saved if an organization of this kind was in existence.

One of the roads represented at this convention is negotiating at the present time with two different firms on matters that could properly be referred to an association of this character. One of the articles in question is used by all electric railways in large quantities, and the inventor is receiving large royalties from the manufacturer. A patent attorney informed the road that he thought the patent worthless, but it would take a lawsuit to convince the manufacturer. If this be true, this road would have saved $10,000 to $15,000 by having this matter investigated at the start, saying nothing about what others would have saved that are using this article to-day and are paying the manufacturer whatever he chooses to ask.

The other device referred to can be manufactured by the companies themselves, which is also true of the former article, and has recently come into use and is being used by several companies in large quantities. The patentee is willing that the street car companies manufacture said devices themselves, providing they will pay him a large sum of money for the privilege of so doing, the company already having paid him many thousands of dollars for furnishing said article up to this time. We understand that a similar device has been used by another manufacturer in the past, though for some reason it was not patented. This being true, the patent is worthless, and his demand for royalty would fall flat were the same taken to the courts for settlement. These two matters are still unsettled, and are very important to the roads in question, as well as to others who are members of this association and are using the same device.

Another road, a few years ago, paid over $1,000 in royalties on a track that was invented by a former employé while working for the road, simply to prevent a lawsuit, as it would cost more than this amount to have defended the suit. Other cases could be mentioned, but I will not take up your valuable time.

Another important feature in this connection would be the collecting of different patented devices in use on our system, the same to be preserved and open to the inspection at all times of the members of the association. In short, we might sum up the most important points as follows:

1. Lessening total expenses in fighting patent suits, etc., as a suit affecting one road would affect all.
2. Uniformity of action.
3. Additional safety in putting on new devices.
4. Greater facility in defending suits, etc.
5. Decrease in number of suits and claims on account of the existence of such an association.
6. Advantage in settling suits.
7. Contesting and avoiding unfair and unjust royalties.
8. Reduction of prices on all patented articles.
9. By members refusing to buy articles where suits are brought against any of its members, thus shifting suits to the manufacturer.
10. The dissemination of valuable information to its members of all matters relative to any suit, etc., in which one or more members are the interested parties.
11. Advantage of employés of street railway companies in getting valuable information and assistance on their own inventions, whether patentable or infringement of other devices, without additional cost to said railway or employé.
12. The acquiring of a full and authentic report of all devices that are commonly found in use on all street railways, such as fare registers, brakes, rail bonds and numerous other articles, giving the expiration of all such patents, opinion on the validity of the same, etc., and to be followed up by like reports from time to time, giving list and opinion of new patents, and list of expired patents.
13. The acquiring of models, devices, etc., for permanent exhibition.

In conclusion, your committee desire to express two plans of carrying into effect the above scheme, and recommend that the association adopts one of the following methods:

1. Provided the members vote to increase the scope of the association, we recommend that a bureau be established to handle all matters pertaining to patents as outlined in this report.

2. Provided it is not deemed best to enlarge the scope of the association at this time, we recommend that the association pass a resolution providing: That the annual dues be divided into two classes, regular and special (or if necessary the by-laws be amended to that effect). That all members be required to pay the regular dues as already provided in the by-laws and that it be optional with members to pay the additional or special dues. That members paying special dues will be entitled to all the benefits to be derived through the agency of a patent bureau to be established under the direct control of the American Street Railway Association. That the special dues be based upon the gross earnings of the several roads. That the association elect a board of control consisting of three members, whose terms shall expire in one, two and three years, respectively, and hereafter electing one member each year. Said board of control to establish and carry on a patent bureau as outlined in this paper, with the funds paid into the American Street Railway Association as "special dues." Provided further that no street railway company be entitled to the benefits and privileges of said patent bureau, except they are regular members of the American Street Railway Association.

Respectfully submitted,

F. R. GREENE,
J. W. MCNAMARA,
Committee.

### The Baltimore & Ohio Electric Locomotive.

The 96-ton electric locomotive has now been in operation on the belt line of the Baltimore & Ohio railway, at Baltimore, Md., since August 4 last, hauling the entire north bound freight service of that railroad. Every train has been handled promptly and the locomotive has been ready at any and all hours during the day, causing no delay to traffic. Nothing has occurred to interrupt the excellent work of the locomotive which has responded to every call without failure either of speed or power.

A few weeks ago a test was made to learn its capacity for running a loaded train on an up grade. For this purpose a train consisting of two steam locomotives, not working, and 27 loaded freight cars was brought to a stop while going north through the tunnel. Here the grade is 42 feet to the mile and the rails were damp and greasy. The weight of the train alone was 1,125 tons or 1,221 including the electric locomotive. Every drawbar was tight, no slack occurring throughout the length of the train. In this condition current was turned into the motors and movement was immediately communicated to the train. At the end of one minute the train was moving at a speed of 10½ miles an hour, and at this point the speed was increased to the usual rate. The total distance moved in 40 seconds was 150 feet, and at the expiration of one minute, 450 feet.

A few days ago a test was made with a dynamometer car placed between the electric locomotive and the train, which consisted of 22 cars loaded with coal, one caboose and two dead locomotives. The total weight was 1,068 tons. On the 10 per cent grade in the tunnel an average drawbar pull of some 25,000 pounds was obtained from the dynamometer diagram. The speed at this point was 11⅛ miles per hour. Comparison with the diagrams obtained in similar service with steam locomotives showed a remarkably uniform and steady pull by the electric engine, due to the absence from it of reciprocating parts, the torque being constant throughout the entire revolution of the wheel. As the capacity of the dynamometer car was only 26,000 pounds, when accelerating the train, the drawbar of the car came up against the safety stops.

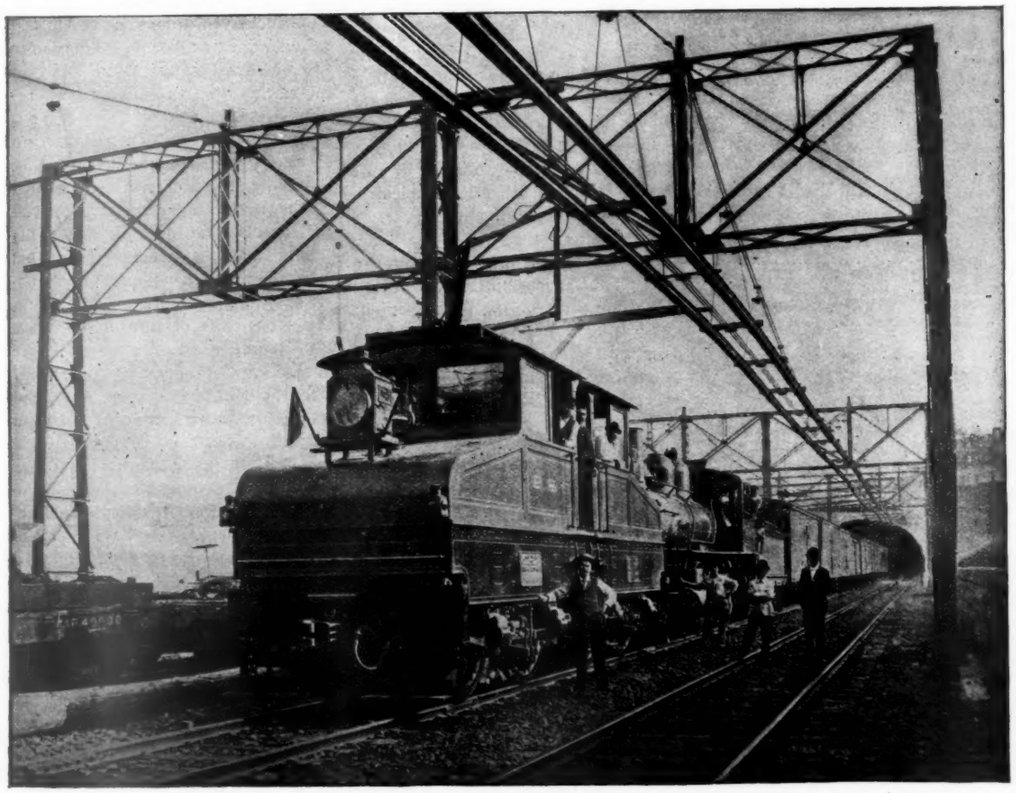
A further test was made with another train, consisting of 36 cars, one caboose and three dead engines. This was a regular through freight train with a local freight attached, and the total weight was in excess of 1,600 tons. It was hauled with ease through the tunnel and calculation from the previous dynamometer records and the drawbar pull per ampere showed a drawbar pull of over 45,000 pounds.

A test made on October 6 has added a new record to the list of remarkable performances of this locomotive. The character of the performance is heightened by the fact that the train which it moved measured over 1,800 feet long and weighed about 1,900 tons and was started from rest in the tunnel. It consisted of a north bound freight train of 28 loaded cars and two locomotives coupled to a local freight of 15 loaded cars and one locomotive. In starting not a sputter, spark or slip of the wheel occurred and the train moved with the same precision as if the circumstances had been of the ordinary character. The drawbar pull of 60,000 pounds was about the record in this case. The train was quickly brought to a speed of 12 miles an hour and pulled through the tunnel without difficulty, with the locomotive continuously exerting a drawbar pull of 40,000 pounds.

Up to the present time no train which would hold together has been found heavy enough to cause the electric locomotive to slip its wheels under ordinary fair conditions. The capacity of the locomotive has been by no means reached. The tests have only shown approximately what the locomotive can do. A dynamometer car of sufficient capacity to test the maximum drawbar pull will shortly be secured, when definite figures can be obtained.

An extension of the overhead work of the electric equipment north to Waverly is being planned by the Baltimore & Ohio Railroad Company. The extension would secure the service of the electric locomotive on the grade from North avenue. It is also contemplated to build south to Baylies, where housing for the electric locomotives will be built. The one now in use is at present side-tracked in the open air when not making runs.

The two additional machines ordered by the Baltimore & Ohio Railroad are nearing completion at the works of the General Electric Company at Schenectady, and when finished the passenger service through the tunnel will be undertaken by them. The accompanying illustration shows the electric locomotive coupled to a north bound freight train issuing from the tunnel.



THE BALTIMORE & OHIO RAILROAD COMPANY'S NINETY-SIX TON ELECTRIC LOCOMOTIVE AND FREIGHT TRAIN LEAVING THE NORTH EXIT OF THE BALTIMORE BELT LINE TUNNEL.

### ITEMS OF INTEREST.

A fire in the works of the National Carbon Company, at Cleveland, O., on November 1, caused a loss of $50,000.

The New England Telephone and Telegraph Company has declared a dividend of 1¼ per cent, payable November 15 to stockholders of record of October 31.

Mr. W. H. Bean, who has recently become associated with Mr. H. B. Cox, the inventor of a thermo-electric generator bearing his name, sailed for Europe last Saturday.

A new telephone and telegraph company was organized in Fort Wayne, Ind., last week, to be known as the Western Telephone and Telegraph Company, and composed mostly of Fort Wayne capitalists. It is the intention to operate a line through the States of Indiana and Ohio, covering a large extent of territory. The organization is the outcome of the efforts of Mr. G. W. Beers. The following officers have been elected: President, G. W. Beers, Fort Wayne; secretary, D. J. Cable, Lima, O.; directors, G. W. Beers, D. J. Cable, H. C. Paul, C. S. Bash. The purpose of the company is to connect a number of the cities and towns of Ohio and Indiana, centering their wires at Fort Wayne.

### The Hatch Storage Battery.

The ELECTRICAL REVIEW is informed by the Hatch Storage Battery Company, of Philadelphia, that an exhibition of the Hatch battery was held at the company's laboratory on October 31. The exhibition lasted from 12 until four o'clock, during which time the batteries continuously operated a group of fifty 16 and 32 candle-power incandescent lamps. In the construction of his battery, Mr. Hatch uses, instead of the usual lead grid, light porous earthenware plates and places the active material upon them instead of in them. By closing the plates together and binding them with light wooden boards and flexible rubber bands, he furnishes lightness and sufficient elasticity to allow for expansion and contraction.

### Wetzler-Gerson.

Miss Pauline Gerson was married to Mr. Joseph Wetzler, editor of our esteemed contemporary, the *Electrical Engineer*, in New York city on Wednesday, October 30, by the Rev. Dr. Silverman. Mr. Wetzler is very well known in the electrical field, with which he has been connected as a technical journalist for many years. The ELECTRICAL REVIEW takes great pleasure in wishing Mr. Wetzler and his wife the fullest happiness and success in their married life.

ELECTRICAL REVIEW

Published at 13 Park Row,
P. O. Box 2339. NEW YORK.

EDITOR:
CHARLES W. PRICE.

ASSOCIATE EDITOR:
STEPHEN L. COLES.

REGISTERED CABLE ADDRESS:
"ELECTVIEW." NEW YORK.

1546 "CORTLANDT," TELEPHONE CALL.

BOSTON OFFICE:
H. G. TUCKERMAN, Room 29, 620 Atlantic Ave

WASHINGTON OFFICE:
GEO. C. MAYNARD, 800 H St., N. W.

SUBSCRIPTION TO THE
ELECTRICAL REVIEW.

*One Year, United States and Canada, - $3.00*
*One Year, Foreign Countries, - - 5.00*
*Single Copy, - - - - - - - .10*
*Back Copies, each, - - - - - - .25*

SPECIAL NOTICE TO ADVERTISERS.

***CHANGES** for advertisements must be in this office by Friday noon for the following week's issue. **NEW ADVERTISEMENTS** should be in the office not later than Saturday noon to insure publication the following week.*

NEW YORK, NOV. 6, 1895.

## CONTENTS.

| | PAGE |
|---|---|
| Views, News and Interviews | 259 |
| Some New Designs in Incandescent Arc Lamps | 259 |
| Electric Light Flashes | 260 |
| Telephone News and Comment | 260 |
| The Electrical Industries of New York State | 261 |
| One Hundred and Seventy-five Passengers on One Car | 261 |
| Personal | 261 |
| What Does This Refer To? | 261 |
| A Double Electrocution | 261 |
| Westinghouse Electric and Manufacturing Company | 261 |
| Sterilizing Milk by Electricity | 261 |
| Report of the Committee on Patents | 262 |
| The Baltimore & Ohio Electric Locomotive | 263 |
| Items of Interest | 263 |
| The Hatch Storage Battery | 263 |
| Wetzler-Gerson | 263 |
| A Certain Test for Death | 264 |
| Wall Street and the Electrical Stock Market | 264 |
| Horseless Carriages | 265 |
| Electric Railway Notes | 266 |
| Municipal Electric Light Plant at Independence, Iowa | 266 |
| The Rating and Behavior of Fuse Wires | 267 |
| Gent's Automatic Revolving Telephone Transmitter | 268 |
| An Unusual Accident | 268 |
| A Safety Appliance for Live Wires | 268 |
| Brooklyn Electrical Society | 268 |
| Storage Batteries for Railways | 269 |
| A French Gas Engine | 269 |
| Advance Information | 270 |
| The Manufacture of Carborundum | 271 |
| Electrical Patents | 272 |
| Kind Words | xi |
| Obituary | xi |
| Literary | xi |
| Kindred Interests | xii |

## INDEX OF ADVERTISERS.

COVER PAGES.

| | PAGE |
|---|---|
| Arendroth & Root Mfg. Co., boilers | xviii |
| American Electrical Works, insulated wire | i |
| Armington & Sims, engines | xviii |
| Boudreaux Dynamo Brush Co., a new foliated anti-friction metal brush | i |
| Bunnell & Co., J. H., dry batteries | i |
| Columbia Incandescent Lamp Co | i |
| Day's Kerite, insulated wire | i, x |
| Eastern Electric Cable Co., wires and cables | xviii |
| Electric Storage Battery Co | ii |
| Goubert Manufacturing Co., heaters | xviii |
| Greeley, E. S., & Co., electrical supplies | xviii |
| Hampson, E. P., & Co., engines | xviii |
| Interior Conduit and Insulation Co., Lundell dynamos and motors | i |
| Law Battery Co., open circuit batteries | i |
| National India Rubber Co., wires and cables | i |
| Okonite Co., insulated wire | i, xviii |
| Partridge Carbon Company, motor and generator brushes | i |
| Phœnix Glass Co., globes and shades | i |
| Rhode Island Tool Co. | xviii |
| Safety Insulated Wire and Cable Co | i |
| Standard Electric Co., arc lighting | i |
| Stirling Co., water tube boilers | xviii |
| U. S. Telephone Construction Co., "M. & B." telephones | i |
| Weston Engine Co., engines | i |

INSIDE PAGES.

| | PAGE |
|---|---|
| Adams-Bagnall Electric Co., arc and incandescent lamps | ix |
| Allen, L. B., soldering sticks | xii |
| American Bell Telephone Co. | xv |
| American Electric Telephone Co., long-distant telephones | xiv |
| Baillard, E. V. | xii |
| Bain, Forée, engineer | xiii |
| Baker & Co., platinum | xiv |
| Baxter, H. E., & Co., electrical supplies | x |
| Beacon Lamp Co., incandescent lamps | xii |
| Belden Machine Co., drop forging | xii |
| Benjamin, Geo. H., patents | xiii |
| Bickford & Francis Belting Co., leather | xvi |
| Bogart, A. L., patent rights for sale | 272 |
| Brill, J. G., Co., railway cars | x |
| Bristol Co., voltmeters | xii |
| Brixey, W. R., Day's kerite wires and cables | x |
| Buckeye Electric Co., incandescent lamps | vii |
| Central Electric Co., interior conduit | iii |
| Chapman Valve Mfg. Co. | vii |
| Chisholm, A., & Co., commutator compound | xi |
| Colgate, Geo. L., Co. | xi |
| Consolidated Telegraph and News Co. | xii |
| Corey, R. B., lamps and carbons | iii |
| Correspondence School of Technology | 272 |
| Crocker-Wheeler Electric Co. | 271 |
| Crown Woven Wire Brush Co. | 272 |
| De Veau & Co., telephones | xiv |
| Dixon, Jos., Crucible Co., belt dressing | xiii |
| Duval, W. S., Jr., patents | 272 |
| Dyer & Driscoll, patent solicitors | 272 |
| Eddy Electric Mfg. Co., Eddy generators | xiii |
| Electric light plant. For sale | xi |
| Empire China Works, porcelain specialties | xiv |
| Eppenger & Russell Co., Valentine subway electrical conduit | xv |
| Euler, H. C., mother-of-pearl | xi |
| Faraday Carbon Co., carbons | xiv |
| Fiberite Co., Medbury insulation | 271 |
| Fleming, W. H., woven wire dynamo brushes | xii |
| For sale. Electric light plant | xi |
| Fort Wayne Electric Corporation. "Wood" apparatus | xi |
| Garvin Machine Co. | viii |
| Gates Electric Mfg. Co. | ix |
| General Electric Co., electric light supplies | iv |
| Globe Electric Light Co., incandescent lamps | vi |
| Harrisburg Foundry & Machine Co., Harrisburg ideal engines | vi |
| Helios Electric Co., arc lamps | vii |
| Heneken Electric Heating Co., electric car heaters | 272 |
| Homer, F. E., & Co., commutators | xvi |
| Hooven, Owens & Rentschler Co., electric railway and electric light engines | iii |
| Huebel & Manger, table push | xii |
| Independent Electric Co. | xv |
| International Correspondence Schools | 272 |
| Keystone Telephone Co. | xv |
| Lane & Bodley, street railway engines | 272 |
| Leffel, Jas., & Co., water wheels | xiv |
| Lehigh Valley Creosoting Co., creosoted lumber | xii |
| Lockwood Telephones | xv |
| Manhattan Electrical Supply Co., Mesco battery | 271 |
| Marshall, Wm., condensers | xii |
| McIntire, The C., Co., connectors and terminals | xii |
| Metropolitan Electric Co. | viii |
| Metropolitan Telephone and Telegraph Co. | xv |
| Moore, Alfred F., insulated electric wire | xiv |
| Morris, Tasker & Co., tubes, poles, etc. | xi |
| National Telephone Mfg. Co., telephones | xv |
| New England Engineering Co. | xiii |
| New York Belting and Packing Co., rubber belts | xiv |
| Ostrander & Co., W. R., supplies | xii |
| Pacific Electric Co., electric water heaters | xi |
| Partrick & Carter Co., electrical supplies for housework | 272 |
| Pemsel, F. | iii |
| Penberthy Injector Co. | xvi |
| Phillips Insulated Wire Co., wire | 271 |
| Replogle Governor Works | 272 |
| Riesinger, Hugo, carbons | x |
| Rodrigues, M. R., premier baby | xiv |
| Royal Electric Co., motors, etc. | ix |
| Royce & Marean, electrical supplies | xii |
| Safety Insulated Wire and Cable Co., "Requa white core." | iv |
| Schoonmaker, A. O., India mica | xii |
| Siemens & Halske Electric Co., machinery for sale | iv |
| S. K. C. Specialty Co. | vii |
| Solar Carbon and Mfg. Co., carbon specialties | xvi |
| Southgate, W. B., & Co. | viii |
| Splitdorf, C. F., induction coils | 271 |
| Standard Thermometer Co., arc lamps | iii |
| Stanley Electric Mfg. Co., S. K. C., system | vi |
| Stanley & Patterson, electrical supplies | vi |
| Stucky & Heck Electric Manufacturing Co. | xvi |
| Warren, A. K., & Co. | xii |
| Washington Carbon Co., "Helios." | viii |
| Waterman, Chas. H., arc lamps | xi |
| Western Electric Co., supplies | xiii |
| Western Telephone Construction Co., telephones | xiv |
| Westinghouse Electric & Mfg. Co., Sawyer-Man incandescent lamps | v |
| Weston Electrical Instrument Co., measuring instruments | x |
| White-Crosby Co., contracting engineers | xii |
| Whitney Electrical Instrument Co. | xii |
| Williams Mfg. Co., red cedar tanks | xi |

### *A CERTAIN TEST FOR DEATH.*

In cases of electric shock, although means of resuscitation should be followed to the limit, it may sometimes be important to definitely determine whether or not death has ensued. In this connection, W. S. Hedley points out in the London *Lancet* a means of distinguishing real from apparent death, which, curiously enough, employs the electric current as the active agent. The test depends on the fact that the muscles of the body will contract under the application of the electric current for only a short time after death, their response to the current ceasing after a certain time. Mr. Hedley says:

"It seems safe to say that in no disease, certainly in none of those conditions usually enumerated as likely to be mistaken for death, is galvanic and faradic excitability abolished in every muscle of the body. On the other hand, electro-muscular contractility disappears in all the muscles within a few hours after death (generally 90 minutes to three hours, according to Rosenthal); its persistence varying to some extent with the particular muscle examined, and with the mode of death. Therefore, if electro-muscular contractility be present in any muscle, it means life or death only a few hours before. It is clear that no interment or post-mortem examination ought to take place so long as there is any flicker of electric excitability. To me it seems almost equally obvious that in all doubtful cases, sometimes in sudden death and often to allay the anxiety of friends, this test ought to be applied, and applied by one who is accustomed to handle electric currents for purposes of diagnosis."

---

Mr. C. L. Bonney, a Chicago street railway man, has made a study of European street railway practice and methods, and is impressed with the benefits of municipal control and operation. He believes that the city should own and control the tracks, poles, wires and other things attached to the public highways just as it owns and controls the streets themselves, but that the cars should belong to the corporations and individuals desiring to operate them. These cars should be licensed by the city, as are hacks and other vehicles, and should be under the regulation of the police authorities. We do not believe that the American people want municipal control of their rapid transit facilities, which means conservatism and red tape. Toronto, Ont., tried the scheme with some success but has abandoned the idea in favor of a good contract with a private corporation.

### *WALL STREET AND THE ELECTRICAL STOCK MARKET.*

The past week was a stormy one in financial circles. The decline in prices that started late last week continued without important interruption during the six days in the period under review, establishing quotations on a basis considerably lower than that of the September decline. The causes leading up to this slump were seated in speculative conditions. Barring European political complications, inducing the usual crop of war rumors, which in turn led to the selling of American stocks by foreign holders, the news, except in cases bearing upon certain individual stocks, was not bearish. The selling was at first by professionals, consisting of stocks they did not possess. This uncovered stop orders and forced considerable liquidation. There were two or three genuine weak spots in the market which assisted bear operations. Among these may be mentioned the heavy outpour of Reading on knowledge that it is to be heavily assessed and the determined attempt on the part of sugar insiders to work their stock lower.

The electrical securities furnished more than their usual quota of transactions, and, at different times during the week, were of unusual interest. Philadelphia had a genuine panic in Electric Storage and Welsbach. These stocks have been advanced several hundred per cent from a mere nothing. It is but natural that on a rise of this kind there should be a comparatively large following of speculators whose margins were small, and whose holdings in consequence were susceptible to attack. When the liquidation in Reading was under way a drive was made at other Philadelphia securities and resulted in a loss from high of about 20 points in Storage Battery stocks. This occurred on Wednesday. There was a partial rally on that day and on Thursday another decline, on liquidation that is almost always certain to follow a panic.

On the Philadelphia Exchange there were 19,170 shares of common and 11,307 shares of preferred traded in up to Friday night. The high was on Monday, it being 72 for the common and 75¾ for the preferred. The low was on Wednesday, it being 49 and 62, respectively. There was a sharp reaction, and on the day following the low was 49 and 64. On Friday closing prices were 53 and 56.

The Philadelphia *Daily Stockholder*, an authority on all matters financial, says of the speculation in Electric Storage that "it grew out of sales of margined holdings, and some calling of loans in which the stocks were collateral. Since the large advance in price banks have been unwilling to accept these stocks as collateral, except in small amounts. There is the highest authority for saying that the people chiefly interested have not sold their Storage, and never had more confidence in the property. About 10 persons own the bulk of the stock. A German company using a storage battery identical in principle

has, in the last eight years, retired its original stock, marked down the cost of its plant, paid 20 per cent per annum and accumulated a large surplus. The Electric Storage Battery Company controls every patent of value in its line of work, and to-day has orders far in excess of its capacity to fill them. The company has a factory at Gloucester, N. J., one in Philadelphia, and is about building another at Niagara Falls. The people who know most about the property believe that its future will compare with the record of the Bell Telephone Company."

Erie Telephone was another stock that furnished a genuine sensation. It has been bulled of late to a point regarded by some as too high. The movement created loosely held speculative holdings, as was the case in Electric Storage, and in a readjustment of position, which occurred in the week, the stock dropped from 67 to 59 in one day, recovering 8 points before the close of that session, and to a still greater degree in subsequent days. It is said by some that considerable stock had recently been sold outside of Exchange circles on a basis of Exchange quotations, and that when it sought a market one could not be found at recent prices. Another statement is to the effect that the regular dividend will be declared and that the financial report shortly to appear will be very favorable.

Still a third security which suffered in values was General Electric. The high point on Monday was 36¼, the low on Wednesday, 29¼. Considerable selling of long stock was detected around the higher figures. This was made the basis of attack by bears who were successful in uncovering stop orders, with the slump of 7 points as noted. There were a great many adverse rumors concerning the property in circulation on the decline, in which talk of sharp competition, small profits, losing business, etc., was current. About the only definite news that was at all unfavorable was the continuation of the founders' strike at Lynn.

Bell Telephone was one of the few strong electrical stocks during the week. It has been sold short to quite a heavy extent on the idea that low prices would be made at the auction of 5,849 shares. The quotation was expected to be 195. It went at 196 to brokers operating in the interest of Blake Brothers & Company, of New York. This created a scramble to cover that put up the price to 199 on the day of the sale. On subsequent days it went to 201 and closed Friday at 200.

Pittsburgh advices report that the Westinghouse Electric Company is doing a very large business at its new works. In September about 25,000 horse-power of electric generators and motors were shipped.

Westinghouse securities lost about 1 per cent. The common was quoted at 34 @ 34½ and the preferred 54½ @ 54¾. BAIN.

New York, November 2, 1895.

## HORSELESS CARRIAGES.

THE FINAL TEST POSTPONED UNTIL NOVEMBER 28 ON REQUEST OF CARRIAGE OWNERS WHO WERE NOT READY—DESCRIPTION OF THE "ELECTROBAT."

The generous offer of the public-spirited proprietor of the *Times-Herald*, of Chicago, of $5,000 in prizes for the best horseless carriage, or motocycle, as it is called here, has attracted unusual interest, and a great many entries were made—over 50 in all. Unfortunately the time—four months—was not sufficient, and it was decided yesterday to give a preliminary trial to-day, and the final test will come off on November 28. Three horseless carriages were started at 9 A. M. to-day to go over a course of 100 miles, but none of these contestants were electrical. It is expected that several will be here at the final test,

MORRIS & SALOM'S ELECTRIC CARRIAGE "ELECTROBAT," ENTERED IN THE CHICAGO "TIMES-HERALD" MOTOCYCLE RACE.

and one—the Electrobat—was expected to go out to-day, but the owners decided to wait until the final test.

Morris & Salom, who are representing the Electric Storage Battery Company, of Philadelphia, have entered two motocycles, which are operated by electric motors, the current for which is furnished by storage batteries. They have coined the new word Electrobat to describe their machines and give them a distinctive name, the termination "bat" being derived from the Greek verb "to go." The larger Electrobat which is here on exhibition and for tests (see illustration) in the preliminary trials presents a very handsome appearance and at first sight one could not tell but what it was some new style of surrey.

No machinery of any kind is in sight, with the exception of the steering lever, and it is exempt, therefore, from the criticism generally passed on motor vehicles—that they look more like a piece of machinery than a pleasure carriage. The carriage seats two, but can be arranged to have another seat on the back.

The body was built for Morris & Salom by the Chas S. Caffrey Company, of Camden, N. J. There are two Lundell motors of nominal one and one-half horse-power capacity each attached to the front axle, and pinions on the armature shafts gear directly into the driving gears attached to the front wheels. The steering is accomplished by turning the hind wheels parallel with each other from a point about three inches inside of the plane of the wheel and connected by a rod to a vertical lever of a convenient height to be operated from the front seat of the carriage. Although at first sight it might be supposed that steering from the rear would be more difficult than steering from the front, yet, as a matter of fact, this has been found not to be the case, as the carriage can be moved with the slightest effort on the part of the driver and with the greatest certainty in any direction desired, and can be turned completely around in a circle of 20 feet in diameter.

The wheels are of wood and of the usual construction, except that they are fitted with pneumatic tires and ball bearings.

The driving or front wheels in the case of this particular machine are 40 inches in diameter, and the rear or steering wheels are 28 inches in diameter. The batteries are furnished by the Electric Storage Battery Company, of Philadelphia, and consist of four sets of 12 cells each having a normal capacity of 50-ampere hours per cell. They are grouped in boxes and so arranged that they can readily and quickly be pushed into place inside the body of the carriage, connection being automatically made with the controller.

The controller is a small instrument standing in a convenient position vertically, in front of the seat and is operated by means of a small hand wheel on top. There are four speeds ahead and one backwards, which are obtained by various groupings of the batteries and motors in series and parallel.

The carriage has a maximum speed of 20 miles per hour on a good road or street pavement, and the capacity of the battery is sufficient to drive it 25 miles.

Its weight complete with batteries is 1,650 pounds.

The smaller Electrobat, which will attempt to cover the course in the race, was built by the Crawford Wheel and Gear Company, of Hagerstown, Md. It is of tubular steel construction throughout and the wheels are built on bicycle principles, having steel spokes, pneumatic tires and ball bearings.

The method of gearing and general operation of the machine is similar to that of the larger Electrobat above described.

This machine has a maximum speed of about 20 miles per hour, the complete weight with batteries being 1,180 pounds, thus making it the lightest electrical road machine ever built.

Testing apparatus, designed by L. L. Summers and John Lundy, will be used to show the efficiency of all of the machines. The judges are Professor John P. Barrett, Mr. Chas. Kimball, General Merritt, U. S. A., and Henry Timken.

In addition to the judges and a large crowd of citizens, the start at 9 A. M. from Fifty-fifth street and Halstead avenue was witnessed by the representative of the ELECTRICAL REVIEW and Mr. W. F. Hammer, of New York.

Duryea, Mueller and Pennington, using gas or gasoline, were the three contestants to-day. A purse of $500 was set aside for the winner of this preliminary contest and was awarded to the Mueller gasoline motor, which covered 92 miles in eight hours and 50 seconds.

The following is a list of those expecting to participate in the final test:

Morris & Salom, Philadelphia.
H Mueller, Decatur, Iowa.
E J. Pennington, Racine, Wis.
Duryea & Hewitt, Springfield, Mass.
B. J. Arnold, Marquette Building, Chicago.
A. C. Ames, Owatonna, Minn.
Alliance Carriage Company, Cincinnati, Ohio.
Bradley, Wheeler & Co., Kansas City, Mo.
Carlos B. Booth, Youngstown Ohio.
Oliver F. Conklin, Dayton, Ohio.
H. H. Carpenter, Monadnock Building, Chicago.
E. D. Cross, 3149 Indiana avenue, Chicago.
W. H. Daley, Charles City, Iowa.
De La Vergne Refrigerating Machine Company, New York.
George Elrick, Joliet, Ill.
R. W. Elston, Racine, Wis.
T. R. Gawley, Aurora, Neb.
R W. Guilford, Auburn, Ind.
Hartley Power Supply Company, Chicago.
Max Hertel, 454 Lincoln avenue, Chicago.
Hill & Cummings, 232 South Clinton street, Chicago.
J. W. Hall & Sons, Jacksonville Ill.
Haynes & Apperson, Kokomo, Ind.
W. J. H. Kappe, Quincy, Ill.
George W. Lewis, 32 Willis court, Chicago.
R. E. Lasher, St. Louis, Mo.
McDonald & Brennan, Chicago.
J. H Woehn, 1810 Fond du Lac avenue, Milwaukee.
M B Mills, 125 La Salle street, Chicago.
A. W. McArthur, Rockford, Ill.
Edwin Meredith, Batavia, Ill.
Maquin Power Generating Company, Chicago.
Perry Oxley, Columbus, Ohio.
Pierce Engine Company, Racine, Wis.
Reil Import Company, 51 Dearborn street, Chicago.
G. W. Robertson, Mount Vernon, Ind.
Otis E. Smith, Hartford, Conn.
Joseph Shaver, Milwaukee.
Sturges Electric Motocycle Company, Chicago.
C. J. and J. W. Schoennig, Oak Park, Ill
Snitz Gas Engine Company, Grand Rapids Mich.
Strong & Gibbons, 181 West Madison street, Chicago.
Stone & Maynard, 438 West Twenty-ninth street, New York.
W. A. Simons, 6612 Wabash avenue, Chicago.
John Templeton, 1616 Masonic Temple, Chicago.
Wayne Sulkeyette and Road Cart Company, Decatur, Ill.
Vernon H. Wilkins, Evanston, Ind.
David H. Wilson, 901 Association Building, Chicago.
Wolverine Motor Works, Grand Rapids, Mich.

C. W. P.

Chicago, November 2, 1895.

## ELECTRIC RAILWAY NOTES.

The people of Franklin, N. H., are seriously discussing the building of an electric railway in that town.

Fred O. Rustling, superintendent of the Buffalo Railway Company, will become the general manager of the Rochester, N. Y., Railway Company on November 13.

A complete system of free transfers has been introduced on the lines of the Brooklyn City Railroad in Brooklyn, N. Y. The Flatbush avenue line will be extended to Bergen Beach.

The experimental street railway mail car on Madison street, Chicago, Ill., having proved satisfactory, the Postal Department at Washington has authorized an extension of the service.

General E. S. Greeley has been re-elected a director and president of the Stamford, Conn., Street Railway Company. Samuel F. Greeley was elected a director, as was also D. O. Lombard.

The hand of fate, as personified in the motor and the trolley, has at last reached the mule, and henceforth we shall see him vanish by degrees before an agency mightier than himself.—*Boston Advertiser.*

An underground wire system, the first in Memphis, Tenn., is now being laid by the Illinois Central and Yazoo & Mississippi Valley Railroads through a portion of the business center of Memphis.

It is authoritatively stated that Mr. Charles Green, president of the People's Railway, St. Louis, Mo., will change the cable system of that line to an underground trolley system within the next year.

Controller Palmer, of Brooklyn, N. Y., on October 25, received a check for $981.86 from the Nassau Electric Railroad Company, being two per cent of the gross earnings of that road for 64 days.

The power house at Cayuga Lake, N. Y., which is to furnish power for the electric road in connection with the main power station at Waterloo, is now under construction and the work is being pushed forward rapidly.

At a recent meeting of the Oneonta, N. Y., Street Railway Company the resignation of T. D. Tallmadge as treasurer and general manager was accepted, and D. A. Diefendorf was elected treasurer and E. W. Pope general manager.

The directors of the Union Traction Company, of Philadelphia, Pa., have decided to fix the rate of fare on all lines at five cents for a straight ride, except to certain suburban points, with eight cents for exchange tickets, abolishing free transfers.

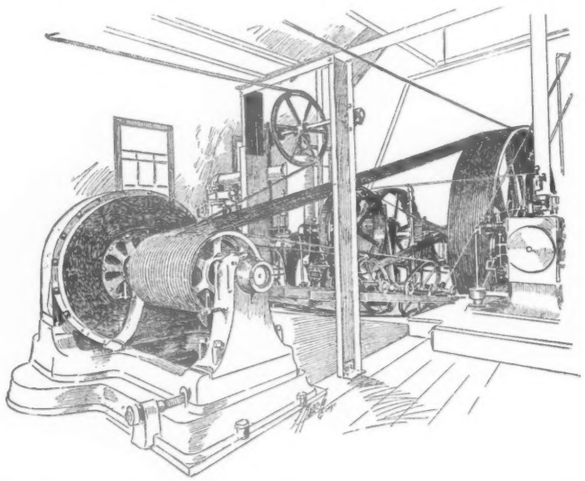
Mrs. Catherine Masterson's suit against the Consolidated Traction Company of New Jersey to recover $20,000 for the death of her husband resulted in the jury awarding her $10,000. Masterson was killed in Bayonne on December 21, 1894.

John L. Kyne, editor of the East Syracuse *News*, has been appointed superintendent of the East Side road at Syracuse, N. Y., *vice* Rollin M. Douglass, who has been appointed superintendent of the Brooklyn Heights road in Brooklyn, N. Y.

The annual report of the Worcester, Mass., Consolidated Street Railroad Company shows gross earnings of $420,498; net, $110,711; charges and dividends, $107,778; surplus, $2,933. Number of passengers carried, 8,403,261, an increase of 1,109,851.

An enterprise of no little interest to the people of St. Paul is reported to be on foot at Ashland, Wis., to build a railroad from that city direct to these two cities, backed by a subscription from the city and county of Ashland of $160,000, and $40,000 by the citizens.

By February 1, if not sooner, the Chicago, Ill., Lake Street "L" Road will be running with full electric equipment. Work is already well advanced. Thirty-five of the present smoking cars are being equipped with motors, and other cars have been ordered.



Interior View of Municipal Electric Lighting Plant at Independence, Ia.

Another step in the consolidation of all the street railway systems of Kansas City, Mo., and tributary territory was taken at Independence recently, when Colonel C. F. Morse, president of the Metropolitan Street Railway Company, bought the Kansas City & Independence electric line for $600,000.

The Metropolitan Traction Company, of New York, which owns several lines of street railway, has recently adopted the transfer system. On one line the increase of receipts on the first day amounted to $2,400, while for the first 15 days of October on the entire system the increased receipts reached over $50,000.

The Newburgh, N. Y., Electric Railway Company reports from May 1, 1895, to October 22, 1895, inclusive: Gross earnings, $61,072; operating expenses, $27,213; net earnings, $33,859. A contract has just been made with the National Express Company to carry express matters on all cars running between Newburgh and Walden.

Portland, Me., is to have electric mail service. Superintendent E. J. Ryan, of Boston, of the railway mail service, was in Portland the first of the week and made arrangements for the inauguration of an electric railroad mail service to supply the surrounding towns with mail from the Portland office by means of electric postal cars.

Damage suits against the Consolidated Traction Company, of New Jersey, have almost monopolized the sessions of the Hudson Circuit Court this term. Verdicts aggregating $43,000 have been rendered against the company. The loss, it is said, will fall on a Philadelphia trust company, which, for a large annual fee, assumes all losses from accidents. The majority of the cases will be appealed.

The Post Office Department has completed its arrangements with the Brooklyn Heights Railroad Company for a mail-car service. The company will run its cars from the Brooklyn Post Office to Station E, East New York, over one route, and from the Post Office to Long Island City over the other route. The company is building two new cars for this service.

The Massachusetts Railroad Commissioners have given their decision on the application of the Lowell & Suburban Street Railway for the privilege of issuing $400,000 new stock, of which $300,000 was to be used for canceling the indebtedness which would be incurred in changing from horse to electric power and $100,000 for park purposes. The commissioners will allow the company to issue $176,500 stock for canceling and $63,500 for park purposes.

The executive committee of the New York & Brooklyn Bridge have decided to permit the electrical companies who may like to do so to put in experimental traction plants at the Brooklyn terminal with a view of adopting some one of these systems for switching cars if it proves to be satisfactory. Chief Engineer Martin was authorized to advertise for proposals. There is some talk, also, that if the electrical system proves satisfactory for switching work it may be substituted for the cable for the entire traction power on the bridge.

The New York city aldermanic railroad committee recently gave a hearing on pending resolutions. One prohibits the passing of street cars within 50 feet of a public school, another provides that in case of blockades street railroad companies shall return fares, and a third provides that street cars shall stop on the first instead of the second crossing. All the resolutions were opposed by President Vreeland, of the Metropolitan Traction Company, who said that their passage would revolutionize street car traffic in New York city. Superintendents Skitt, of the Fourth avenue line, and Langdon, of the Grand street line, also opposed them.

There is in the public mind a confusion of ideas as to the speed of electric street cars, says a St. Louis paper. Two inexpert observers guessing at this speed will rarely come within miles of the correct estimate. Yet it is possible for anybody, by a simple calculation, to arrive at very nearly accurate information. An electric car going at the rate of a mile an hour travels 88 feet in a minute. At two miles an hour it makes twice that distance in a minute, or 176 feet. At three miles an hour the distance traveled in a minute is three times 88, or 264 feet. This distance of 264 feet is about the length of an average city block. If it takes a car a minute to go a block the rate of speed is three miles an hour. If the car goes two blocks in a minute the rate is about six miles an hour. Three blocks in a minute means nine miles an hour. Four blocks in a minute indicates a speed of about 12 miles an hour. At five blocks in a minute a car is going 15 miles an hour. When six blocks are traversed in a minute the speed is 18 miles an hour. A rate of seven blocks in a minute is a speed of 21 miles an hour. It must be understood that average blocks are required to make good such estimates.

### The Municipal Electric Light Plant at Independence, Iowa.

The city of Independence, Iowa, in 1886 constructed a waterworks plant, which, up to the present time, has cost $65,000. Recently, the building containing this plant has been extended to accommodate an electric lighting plant, owned and operated by the city. The equipment consists of a 350 horse-power engine and a dynamo supplied by the Standard Electric Company, of Chicago, with a capacity of 3,500 lights. This machine is an alternator of the multipolar type. The switchboard is of white polished marble and the entire equipment of the plant is up to date. The number of applications already received for light would indicate that the plant will be a paying one when current is turned on about the first of the year. The electric light plant has cost to-day about $25,000. There are some other items still chargeable to the cost of the plant which have not yet been counted in.

## THE RATING AND BEHAVIOR OF FUSE WIRES.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NEW YORK AND CHICAGO, OCTOBER 23, 1895, BY W. M. STINE, H. E. GAYTES AND C. E. FREEMAN.

*(Concluded from page 245.)*

The results plotted in Fig. 2 are significant. The upper curve was obtained from three-ampere fuses in the covered block. The curve is here more sharply marked than in the case of the same wire blown in an open block. This was found to be true for all sizes of wires tested in this manner and indicates that a fuse is more sensitive in a covered than in an open block. In this case the shorter distance between the terminals raised the fusing point and increased its inertia for higher currents.

It was considered desirable to obtain data which should exhibit the action of the fuse with the cooling effect of the terminals eliminated. To accomplish this, the fuses were blown in lengths of eight inches, with asbestos supports placed each inch of length, the black in all cases being horizontal. The supports practically prevented the breaking of the fuse from hydrostatic pressure. The results with A. and B. wires, and the german silver (18 per cent), as well, are shown in Figs. 3 to 6. It was supposed, though such curves are hyperbolic, that for abnormally high currents they would exhibit somewhat constant inertia times, due to the oxide coating and other mechanical causes. The results clearly confirmed this, the inertia time constant in some cases amounting to two seconds.

The blowing of the fuse is not immediately an electrical act. The current fuses the metal, the cross-section is reduced at some point due to gravity, unequal expansion, or "sweating;" the heat in consequence intensifies at this point and a globule falls, breaking the circuit and establishing an arc, which soon burns out a length of the fuse. This accounts for the sluggish action of such thermal cut-outs. An ideal fuse would be one that would act at approximately a constant time interval for all currents in excess of its normal. It would, in this respect closely resemble the action of an electro-magnetic cut-out. Its curve would be a straight line extending from its normal point and slightly approaching the vertical axis for all abnormal currents, being thus identical with the curve of the electro-magnetic cut-outs. In practice the curves of all thermal cut-outs must be more or less modified hyperbolas. The ideal curve could only be attained were it possible to eliminate conduction and radiation losses. This is evidently the line to follow in designing a sensitive fusing block.

The curves in Figs. 3 and 4 clearly exhibit the relative sensitiveness of small and large fuse wires; the smaller diameters approach more nearly the ideal condition. This is of great practical interest in guarding against excessive currents of short duration, such as motors are subject to when operated from street railway and power circuits. In such cases a multiple fuse of four pieces of five-ampere wire would prove from two to three times as sensitive as one piece of 20-ampere size. Such multiple fuses have been found by the writer to effectually prevent the belt slipping off the pulley of small dynamos under short circuits. The sluggishness of large fuse wires may be due to the cooling of the outer layers which, with the oxide coating, prevent the fuse from breaking. It is evident that this effect would be less in small wires. For this reason a thin ribbon should prove more sensitive than a round wire.

These tests with long lengths of wire reveal some actions which may account for the lowering of the fusing point by use. In the A. wires, with a current just below the fusing value, the wires were found to "sweat;" the oxide film broke in places and allowed the molten interior to ooze out. When the current was shut off the globules were drawn in, leaving the wire pitted. With the B. fuses the metal was found to be remarkably plastic and free from the oxide film. These fuses sagged badly and twisted, showing a high coefficient of expansion. As a result they were drawn out and the cross-section reduced.

When used vertically, the metal flowed until a large globule formed, the rupture occurring just above this. In the case of the german silver fuses the sweating resulted in partially breaking up the alloy, the zinc seeming to melt out from the nickel and, fusing with the copper, formed globules of brass. This was so marked that it would render such fuses too uncertain for use in all but the smallest diameters of wire.

A comparison of the three-ampere curves in Figs. 2 and 3 shows the effect of shortening the fuse. The blowing current for 15 seconds of 6.3 amperes in the case of the short fuse in the open porcelain block was raised to 10 amperes. Excepting the higher fusing points, the curve of the long fuse is the same as that for the shorter length. It is evident from such data that the usual rating of fuse wires in ampere carrying capacity is practically valueless, and should be discontinued. The proper designation for such wires would be a table of carrying capacities for the lengths ordinarily employed.

The 10-ampere wire of Fig. 3 fused in 30 seconds at 15 amperes in an eight-inch length; in a length of one-half inch in a covered block at 35 amperes, and in the open block, length seven-eighths inch, at 25 amperes. Accompanying each spool of the B. wire was a stated carrying capacity for a given length, but this is not sufficient, since it furnishes no guide for other lengths.

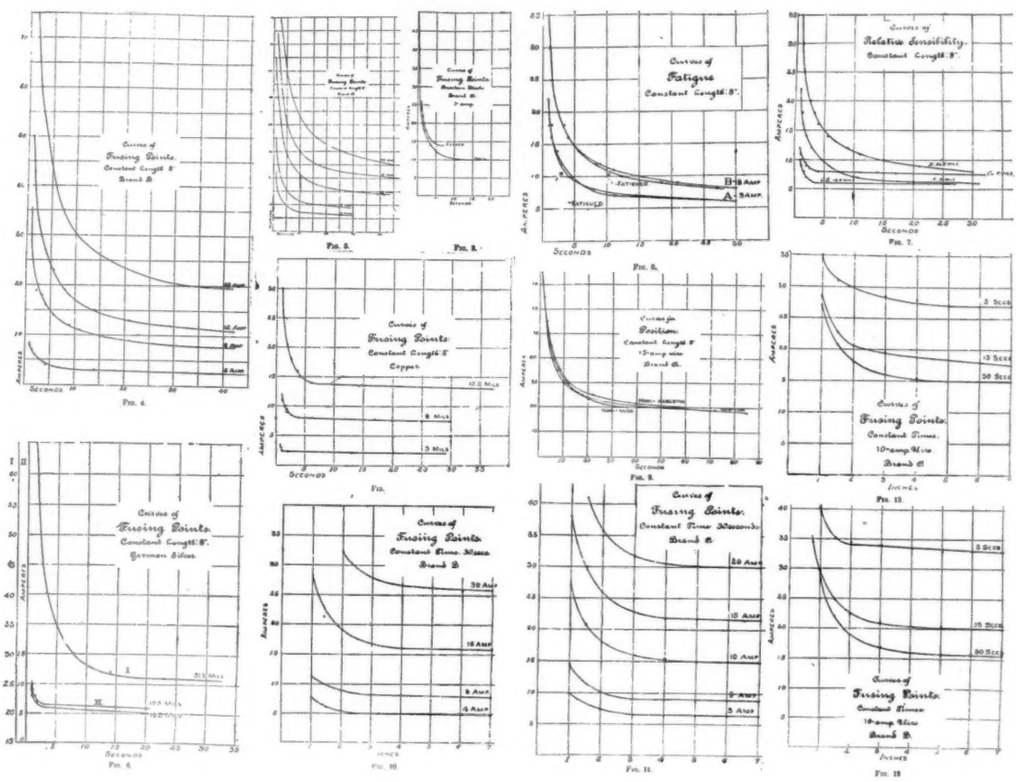
Copper fuses have frequently been stated to be more prompt in action than the alloys usually employed. Compare the curve of the 12.5 mil copper wire (Fig. 5) with that of the 12-ampere wire in Fig. 4, and the increased sensibility of the copper fuse is apparent. The plastic condition of the ordinary fuse alloys extends through a proportionately greater temperature range than the copper, resulting in a rounded curve. The copper fuses reached red and even white heat in these tests, while the other fuse wires scarcely reached a perceptible glow. This has a practical significance in selecting metals for fuse wires. Metals in general, which can be worked at or near a white heat, will prove most sensitive, since a slight increase of heat will make them highly fluid, and rupture will promptly occur. The practice of using copper in street railway circuits for limit fuses seems justifiable. Whether the oxide film of copper fuses would prove progressive in formation is a question which has not been definitely settled. A 3-mil copper wire, which fused at 2.2 amperes in 13 seconds, was fatigued at a red heat for eight minutes; cooled and tested under the first condition, it fused at 2.2 amperes in 14 seconds.

The A fuses, cut from the ordinary lead-tin fuse wire, only worked at a bright red heat in very short lengths, such as one-half inch. This undoubtedly influenced the sharpness of the curve for the closed block in Fig. 2, and is a fact that seems to possess some practical importance. Our tests in general showed the desirability of working fuses at a red heat for normal maximum loads. But this is a question which must be eventually left with the underwriters.

Fig. 7 gives the relative sensibility for the different fuse metals tested, and the copper curve is clearly the best. German silver acts well in these wires, but for the larger sizes, Fig. 6, it offers no advantages, and deteriorates more rapidly than any wire tested. It is now in general use on telephone and similar circuits. The wire is about four inches in length and inclosed in a fiber tube. A number of such fuses, obtained from the Chicago Telephone Company, were tested. They were rated for a carrying capacity of five amperes and fused in all cases within six amperes. A slight variation in fusing was no doubt due to the cooling effect of the tube in contact with the wire. Some such device as this, with copper wire for the fuse, would be most excellent for electric lighting and power circuits.

It was thought best to study the influence of "fatigue" on a wire. A special board was prepared with two rows of insulated pins place 10 inches apart. A length of fuse wire was threaded back and forth over these, the wire being supported out of contact with the board. A current, just short of the fusing strength, was passed for seven hours. The results are plotted in Fig. 8. It will be noticed that the A fuses experienced a position fatigue, the B wire a negative one. This is of importance in practice, and shows the superiority of the B wire, whose fusing point was lowered while the other was raised, due to a diminution of cross-section and absence of oxide film.

A great deal has been said about the influence of grease films on lead fuses. This point was also investigated. The grease was removed from the wires by immersion in KOH and $NaOH$ with subsequent washing. In other cases the wire was cleaned by the use of fine sand-paper. The


Curves of Fusing Points. Constant Caught 8'. Brand B.
Curves of Fusing Points. Constant Caught 8'. Copper.
Curves of Fusing Points. Constant Caught 8'. German Silver.
Curves of Fusing Points. Constant Time. Brand B.
Curves of Fatigue. Constant Caught 8'.
Curves of Relative Sensibility. Constant Caught 8'.
Curves of Position. Constant Caught 8'.
Curves of Fusing Points. Constant Time. Brand B.
Curves of Fusing Points. Constant Time. Brand B.
Curves of Fusing Points. Constant Time. Brand B.
Seconds
Amperes
Inches

Diagrams Referred to in Paper on The Rating and Behavior of Fuse Wires.

oxide film was also removed by immersion in nitric acid. Measurements showed that this treatment did not sensibly reduce the cross-section When the oxide film was removed by either mechanical or chemical means it was noticed that a thicker coating formed at once, raising the fusing point. In short, these tests showed that nothing was gained by cleaning the wires, but that the thin film of grease deposited during the drawing of the wire was rather an advantage. The wire was also coated with shellac, but without encouraging results. Some coating, not affected by heat, and which would reduce the radiation, would doubtless increase the stability and sensibility of fuse wires.

For the following tests an adjustable fuse block was constructed on which the fuse was held about one inch above the base and supported each inch by either thin asbestos or mica supports. In order to ascertain the influence of these supports, tests plotted in Fig. 9 were made. The influence of hydrostatic pressure is shown by the horizontal curve with the asbestos supports being higher than the vertical curve. The curve with mica supports is lower for the reason that the mica cut the softened wire.

A singular phenomenon was noticed with the A fuses blown horizontally in the eight-inch block. The arc would usually occur at about the same place near the center of the fuse, and when the time was within six seconds, the entire fuse was shattered into approximately equal lengths, varying from three-eighth-inch to three-quarter-inch, depending upon the current employed. The length of these pieces varied inversely with the current strength. The uniformity of these results was noticeable throughout all our tests. The entire fuse, to within a short distance of the terminal, seemed to explode into fragments simultaneously with the formation of the arc. This rhythmic action has been pointed out by the author for copper wire fused by lightning.* The ends of such pieces invariably showed a crystalline structure, indicating that the entire fuse was melted, and prevented from flowing by the oxide film.

So much seems to depend on the cooling effect of the terminals that it was determined to work this point out with great care. The terminals of the adjustable block were made of brass, and purposely made unusually massive. Care was also exercised to keep the terminal contacts bright and clean. Constant fusing times were adopted, with varying lengths. This method of experiment is extremely tedious, since it is not only difficult to ascertain the exact current for a length in a given time, but any slight draught or variation in the current will produce a sensible modification in this time. Up to this point the current has been obtained from a 50-kilowatt, 110-volt direct-current dynamo, furnishing a sufficiently constant electro-motive force. For the following tests a storage battery of sixty 180-ampere-hour cells was employed. The result for a constant time of 30 seconds is shown in Figs. 10 and 11, and for constant times of 30, 15 and five seconds, in Figs. 12 and 13. The relation between size of wire and length of fuse for maximum sensibility is shown by the curves of Figs. 10 and 11. The curves of Fig. 13 exhibit well the sluggish action of the fuse wire. For five seconds two inches is the critical length, while for a time of 30 seconds it is nearly five inches. Data for times longer than 30 seconds are not materially different from those at this period. For a given fuse, then, blown in a given time, there is a critical length. We are now in possession of full data for the complete discussion of this most important question.

If a fuse is to be employed for maximum sensibility at normal rating, the curves of Fig. 11 will enable the length to be determined by the location of the critical point in the curve, which is the point at which the cooling effect of the terminals becomes marked. For three and five-ampere fuses, lengths of two and one-half inches should be employed; the 10 and 15-ampere fuses indicate a length of three and one-half inches, the 20-ampere of four inches. Judged of by common practice, these lengths seem excessive, but the data clearly indicate where practice might be corrected.

Comparing the curves in Fig. 2 with these, it is readily seen that the effect of the terminals is equivalent to shortening the time as in Fig. 13, and so increasing the carrying capacity. But these short lengths in no case fuse normally. It is only adding the complexity of the fuse to the uncertainty of the contact. Should the fuse itself become oxidized, the carrying capacity will be largely augmented. We believe sufficient data have been presented to show that it is poor practice to employ short lengths to economize in porcelain.

We may now summarize some of the practical conclusions deduced:

1. Covered fuses are more sensitive than open ones.

2. Fuse wire should be rated for its carrying capacity for the ordinary lengths employed.

2*a*. When fusing a circuit, the distance between the terminals should be considered.

3. On important circuits fuses should be frequently renewed.

4. The inertia of a fuse for high currents must be considered when protecting special devices.

5. Fuses should be operated under normal conditions to insure certainty of results.

6. Fuses up to five amperes should be at least one and one-half inch long, one-half inch to be added for each increment of five amperes capacity.

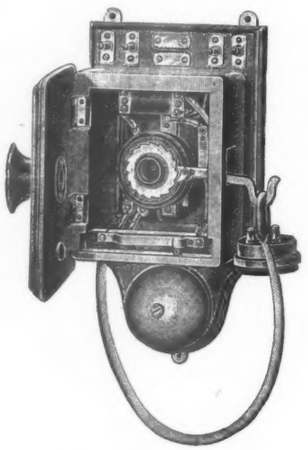
7. Round fuse wire should not be employed in excess of 30 amperes capacity. For higher currents flat ribbons exceeding four inches in length should be employed.

* *Electrical Engineer*, June 13, 1895, p. 38.

Since the new Winter timetable on the Bridgeport, Conn., Traction Company's lines went into effect the number of cars operated has been 38. This is considerably fewer cars than were required to accommodate the Summer traffic. The road is now operating 76 miles of track. The earnings of the company for the week ending October 21, 1895, were $5,939, against $3 547 for same week in 1894, an increase of $2,392. From October 1, 1895, they were $17,584, against $10,612 for the same period in 1894, an increase of $6,971.

### Gent's Automatic Revolving Telephone Transmitter.

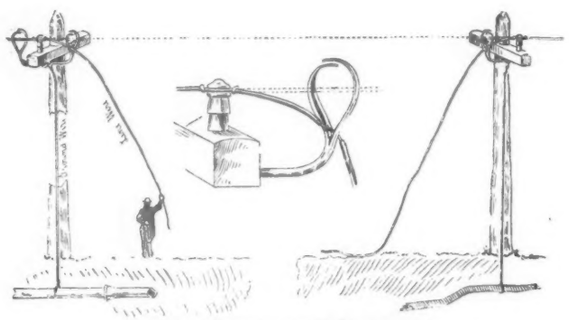
In transmitters of the granulated carbon or Hunnings variety, the carbon is apt to cake or wedge at the bottom, and speaking is thereby much impaired, says the London *Electrical Engineer*. To overcome this, instruments with revolving transmitters were some time ago put on the market, the purpose being that by giving a half-turn or so to the mouthpiece, which was fixed to the microphone or transmitter case,



GENT'S REVOLVING TELEPHONE TRANSMITTER.

the carbon might be shaken up and speaking rendered clearer. That this is a necessity is proved by the fact that the Hunnings instruments adopted by the post office are so fitted.

Even if one always thought of it, it is somewhat troublesome to have to give the mouthpiece a turn before speaking; and to obviate this, Messrs. Gent & Company, of Faraday Works, Leicester, have brought out an instrument in which the transmitter is automatically revolved. The arrangement is shown in the accompanying illustration, and it will be clear that the microphone case is moved round a little every time the receiver is taken off its hook. In another form, this automatic rotation is performed not by the switch-hook, but by the ringing key.



A SAFETY APPLIANCE FOR LIVE WIRES.

The gross earnings of the Bridgeport, Conn., Traction Company for the first nine months of 1895 were $228,439 against $93,281 last year. Net earnings were $112,681, or $37,681 more than the interest charges for the entire year.

### An Unusual Accident.

An unusual accident happened recently in the car depot of the Broadway cable road at Fiftieth street and Seventh avenue. Several men were lowering cars on a big elevator which is used for the purpose. A Seventh avenue surface car had just been lowered to the ground floor, and was still on the elevator waiting to be pulled off, when another car tumbled through the elevator opening from the floor above, where the cars are stored for the night. John McEllanery was standing on the front platform on the car which fell. The tracks on the second floor leading to the elevator are on an incline. McEllanery had put on the brake and was waiting for the elevator to ascend, when the brake gave way and the car rolled into the elevator shaft and fell on top of the car below. The two cars were demolished. McEllanery was thrown headlong through the opening to the lower floor. His skull was fractured and right leg broken. He died soon after being taken to Bellevue Hospital. The two cars were valued at $1,500.

### A Safety Appliance for Live Wires.

Mr. A. E. Hutchins, of Detroit, Mich., has patented a method of cutting out live wires carrying heavy currents which seems to possess several meritorious features. The method is shown diagrammatically in the accompanying illustration. A ground wire is attached to the pole supporting the wire and the ground wire is connected with a metallic plate or pipe buried in the earth. The upper end of the wire attached to the pole is connected with a specially made insulated metallic bracket in the form of a crotch or fork. Just above this bracket the line wire is bared for a few inches. If any accident should happen, causing a break in the line wire, it would fall to the ground, the bare place would come in contact with the crotch in the bracket and the heavy current would be diverted through the wire on the pole to earth. Mr. Hutchins states that he has handled, with perfect safety, a line wire carrying a current of 3,000 volts when the pole was equipped as described above.

### Brooklyn Electrical Society.

"The Latest Appliances for the Measurement of Electrical Resistances" was the subject of an interesting lecture delivered by Mr. Otto T. Louis, before the Brooklyn Electrical Society, on Tuesday evening, October 29, in the Edison Assembly Rooms, Brooklyn, N. Y.

Mr. Louis described at length all the more important resistance testing instruments in their process of manufacture, also a new form of American standard, which is an improvement on the British Association unit. The lecturer also described and exhibited a new bridge capable of measuring resistances as low as that of three-quarter-inch bar copper. At the close of the lecture Mr. Louis made several donations to the society.

## STORAGE BATTERIES FOR RAILWAYS.

BY MAURICE BARNETT.

In these days, when it is the practice of not a few eminent electrical engineers to damn the storage battery in the field of traction, either by too vehement denunciation or by "too faint praise," the announcement in the *Kolnische Zeitung*, that the trolley system, which has been in use in Hanover for some time, has been discarded, and that the 28 cars operated on that system are to be remodeled and equipped with storage batteries, while not conveying solace to the electrical engineers referred to, will prove very gratifying to those who, even in view of some discouraging failures in accumulator traction, have always had a firm conviction that traction work was a legitimate field for accumulators, and the test of time would prove that storage batteries would be able to hold their own with other representative electric traction systems.

Since the announcement in the *Kolnische Zeitung*, news has been received here that the Dresden Tramway Company and the Hague Tramway Maatschappy have likewise decided in favor of accumulator traction. Inasmuch as no less important a company than the Tudor Storage Battery Company is making the installation, it is not at all too optimistic to believe in the ultimate success of the storage battery cars about to be operated in the above named places.

Up to the present time the engineers of the overhead system have had matters pretty much their own way. Occasionally a statement of results (coming in all probability from interested sources) bearing upon the success obtained with the open conduit has caused a commotion in the trolley ranks; but, save for that, the erection of poles has gone merrily on and the manufacturers of trolley machinery have had no complaints to offer on the ground of lack of orders. The past two months, however, have seen the beginning of a mighty change. To-day the trolley is considered to have been merely coincident with the evolution of the modern passenger railway, and that its usefulness in the future, at least in cities, is not likely to be greatly overestimated. E. H. Johnson, who, with Lieut. F. J. Sprague, was the pioneer in working out the trolley method of electric transportation, writing under date of October 9, sounds the doom of the overhead line at least in cities and towns. The reason for this belief is to be found in the objection to overhead construction, and, secondly, in the fact that greater economies are possible in the newly projected closed conduit system, by reason of the fact that higher voltage may be maintained than is practicable in trolley systems. This criticism, emanating from one of the parents of the overhead wire system, may be considered to have some weight. Mr. Johnson also proceeds to pay his respects to the open conduit system anent the great ado made by the Metropolitan Traction Company, of New York, "over the practical success of their $150,000-per-mile-open-conduit system," by saying, "it was neither scientific nor business-like to place the electrical conductors in a sewer and then expend hundreds of thousands of dollars to secure drainage." This represents the view that is at present held respecting the open-conduit electric system. Surely the friends of the electric accumulator can take hope in the discomfiture of their rivals.

Looking impartially at this question, it would seem as if the contest for supremacy in the field of transportation would, in the future, be between the storage battery and the closed-conduit systems. Which side will win cannot be conjectured at the present time. Neither system is in the final form it will assume when the contest for supremacy takes place, and one is therefore precluded from indulging in prognostications regarding the outcome.

The above remarks have been called forth by statements appearing from time to time in some of the newer electrical journals, reflecting upon the judgment of those who are instituting the test with storage battery cars on the Madison avenue line in New York city. The remarks have all been characterized by a sneering incredulity as to the value of accumulators for traction work. Before the next six months are passed the critics of the storage battery system may have to reverse their conclusions.

The object of the present paper is to emphasize the great value possessed by storage batteries—not in furnishing direct motive power, but when used in connection with railway power plants.

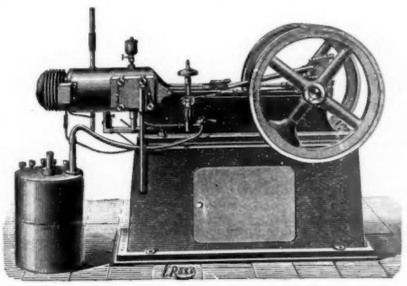
The first accumulators used in connection with a railway power station were, so far as the writer can ascertain, those employed in the power plant of the railway lying between Zurich and Hirslanden, Switzerland, an account of which was published in the *Elek. Zeit*, of June 28, 1894. According to report the dynamo delivers current under a constant load, the accumulators being charged or discharged as load on the line is less or greater than the output of the dynamo. In this plant there were automatic means for cutting in and out of end cells to keep the voltage constant. Results showed that by means of the accumulators a saving was effected of 2.2 pounds of coal per hour, amounting to nearly a ton per day, or $2,500 a year. The cost of accumulators, installed complete with necessary apparatus, was $7,400. Allowing for interest and depreciation, the battery paid for itself in four years by saving in coal bills alone. The saving was effected by reason of there being no necessity to keep a second boiler and steam engine in reserve, and that by this arrangement the power plant ran at its highest efficiency. It was furthermore developed that the first cost of combined steam power and battery plant was less than cost of total steam power plant would have been for the same work.

How important this installation proved may be judged from the fact that a single type of storage battery is now found in Germany and Austria, in 80 per cent of all central stations, besides being installed in 15 railway power plants and 5,000 isolated lighting plants.

Two railways in the United Kingdom have recently attracted a great deal of attention; and inasmuch as the batteries used in connection with generators are of the chloride accumulator type, manufactured by the Chloride Electrical Storage Syndicate, Limited, the installations have a special interest for American railway managers. These two railways are known as the Douglas-Laxey line and the Snaefell Mountain electric tramway, both in the Isle of Man.

The Douglas-Laxey line was established about a year ago. From the September 19, 1895, issue of *Lightning*, London, it is gathered that when the battery was connected to the line the cars immediately began to run with exceptional smoothness, the accumulators keeping the voltage steady and eliminating all sudden variations due to starting of other cars. How variations would otherwise arise will be understood when it is considered that it requires 150 amperes at 500 volts to carry a loaded car up the eight and one-half per cent grade at a nine-mile rate.

Encouraged by the success attained by the Douglas-Laxey electric tramway, which after a year of service "had fulfilled in every way the expectation of its promoters," it was not difficult to secure capital to construct an extension of this road up to the summit of Mount Snaefell. The electric equipment of the Snaefell road resembles that of the Douglas-Laxey line, both being designed by no less eminent an engineer than Dr. Edward Hopkinson. The battery consisted of 246 special cells. At 550 volts, battery furnished 176 amperes for three hours, 112 amperes for six hours, 84 amperes for nine hours and 72 amperes for 12 hours. By evening up the load on the generators, the battery enabled the plant to work at a high efficiency and rendered the service extremely satisfactory.



A French Gas Engine.

A large economy is made possible by a special use of battery at seasons of the year when there is comparatively little traffic. Under the agreement with the authorities these lines bound themselves to run two cars a day each way every day of the year. Obviously, it would not have paid to keep the power house in operation just for this load. This is where the battery proves so valuable during the Winter months. The battery being charged once a week can carry the load for the other six days without necessitating the running of the power plant.

In the United States there are two installations of storage batteries in connection with railway power plants which are of special interest. The first is at Merrill, Wisconsin, where a battery of chloride accumulators was installed to effect a solution of the problem so constantly occurring in the railway world, *i. e.*, How to bring up the capacity of the power plant to meet the requirements of a constantly increasing demand. It was decided to use a battery not alone for increasing the light capacity, but for regulating the voltage on the railway circuit, which, according to the engineer who installed the plant, "was far from satisfactory owing to the great fluctuations in railway demand." As the lighting machine and railway generator were connected to the same shaft, it can be understood that the light furnished was far from satisfactory. Records kept before battery was installed showed a fluctuation as high as nine volts on each side of the three-wire system. Mr. Herbert Condict, in a paper descriptive of this plant, read before the Northwest Association of Electrical Engineers, at their last convention, spoke of the performance of this battery as follows: "The great improvement in running cars was immediately noticed by all, but it was at night that the contrast was most apparent. The two water wheels were connected together as usual, but the railway generator charged the battery at almost a steady rate instead of with its ever-varying demand of from 0 to 120 amperes per car. * * * Instead of a succession of sharp peaks the voltage curve of lighting circuit became practically a straight line; instead of nine volts variation, there was practically no variation, demonstrating most clearly the capability of battery to respond to all demands of railway, no matter how severe."

The second plant mentioned is now being installed at Anaconda, Montana, for the Electric Railway, Light and Power Company, of that place. The battery consists of 270 special cells of central station type of 600-ampere-hour capacity, but admitting of very heavy discharges. The object of battery is to even up load on generators and maintain constant electromotive force. When the battery goes into operation it will be found to give results no less satisfactory than those obtained with the Merrill plant.

To sum up, it may be said that the storage battery is destined to play a very important part in the future in light, heat and power stations. The reason for this statement is to be found in the ability of a good storage battery to act:

First. As a "reservoir" in which may be stored up the energy representing the difference between the average and the maximum demand on a generating plant.

Second: As a regulator of pressure on circuits subject to fluctuating demands—increasing the efficiency of the service and diminishing the wear and tear on apparatus, and

Third: As a "transformer," to utilize high-voltage charging currents and to discharge, when disconnected from generator, at any lower voltage desired.

One fact that has been demonstrated, and which has the most important bearing on the construction of electric railway power plants, or, for that matter, of most electric light or power stations, is that in any station which has to meet a fluctuating demand for power, a plant consisting of part steam power and part storage battery is cheaper in first cost than a total steam power plant would be for the same work. The high efficiency and satisfactory performance of such a plant have already been referred to.

### A French Gas Engine.

On exhibition at the office of A. L. Bogert, 22 Union square, New York, is a one-half horse-power engine which operates by gas or gasoline without necessitating any alteration. These engines have been in use in France and the inventor is making this exhibit with the view of disposing of the American patent rights. The improved features claimed for this engine are that it is the smallest for brake horse-power, the impulse is at each revolution instead of alternate revolutions, thus making the operations more even, and that it runs equally well with either gas or gasoline.

# ADVANCE INFORMATION.

**VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.**

**We publish below the earliest information obtainable relating to new electric railways, new electric light companies, new telephone companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week.**

## New Electric Railways.

CORRY, PA.—Corry City Electric Street Railway Company has been incorporated with R. N. Seaver, president. Capital stock $18,000.

ALLEGAN, MICH.—Saugatuck, Holland & Southeastern Railway will build an electric road from Otsego to Holland. About $75,000 has already been expended on the work.

LYONS, MICH.—Ogden Street Railway Company has been granted franchise to build street railway in this place.

PITTSBURGH, PA.—Ohio Valley Street Railway Company has been incorporated to build road from west line of Avaldon on the Braver road to the eastern terminus of the People's Traction Railway Company. Capital stock, $100,000.

PLEASANTVILLE, PA.—Steps are being taken to construct an electric railway to Hyde Park.

AUBURN, N. Y.—Auburn Street Railway Company has been granted a franchise to build a line from North street through Park avenue.

OTTAWA, ONT.—The Canada Electric Railway and Power Company has made application to build an electric railway from Montreal to Windsor, Ont., by way of Brockville, Kingston, Belleville, Toronto and London.

SYRACUSE, N. Y.—Oneida Electric Railway Company will construct an electric road to Sylvan Beach on Oneida Lake.

XENIA, OHIO.—The Rapid Transit Company has been incorporated by ex-Congressman John Little, S. M. Allison, Marcus Shoup and others to build an electric railway, also to furnish electricity for heating and lighting. Capital stock $3,000.

YOUNGSTOWN, OHIO. — The Youngstown Park and Falls Street Railway Company reports increase of capital stock from $50,000 to $200,000.

AKRON, OHIO.—The Akron & Cuyahoga Falls Rapid Transit Company has increased capital stock from $300,000 to $600,000.

SAGINAW, MICH.—The new electric railway between Saginaw and Bay City has secured right of way and is making rapid progress in the construction of the road.

WATERBURY, CONN.—It is reported that the Consolidated road is negotiating for the purchase of the Waterbury Traction Company's property. It has a capital of $600,000.

ROCHESTER, N. Y.—The Irondequoit Park Railroad Company has been incorporated to conduct the old Glen Haven Railroad. Electricity will supplant steam and the road will be changed to standard gauge. The capital stock is $100,000 and the directors are Chauncey B. Woodworth, Nicholas Brayer, Frank Ritter, Frank Taylor, F. P. Crouch, J. M. Taylor and John D. Lynn.

JAMESTOWN, N. Y.—It is reported that the Erie will double track its road between this city and Lakewood, and perhaps build a new depot.

WARREN, MASS.—The matter of an electric road from this place to Ware and on to Gilbertville is again being agitated.

DUNDEE, MICH.—An electric railroad is projected from this place to Monroe.

WINOOSKI, VT.—The Military Post electric cars are being equipped with electric heaters.

MERIDEN, CONN.—The local electric railway system has been sold by the Philadelphia syndicate that owned it to the Consolidated road.

NORRISTOWN, PA.—Messrs. J. W. and D. B. Shepp have sold for $380,000 to a New York syndicate headed by Mr. C. D. Beebe, of Syracuse, N. Y., their interests in the street railways of Norristown, of which they were the practical owners.

EMPORIA, KAS. — J. O. Patterson has petitioned the Council for a 30-year franchise to build an electric street car line.

KANSAS CITY MO.—Missouri, Kansas & Texas Trust Company has applied for franchise to build a $250,000 double track electric railway to Wyandotte.

SPRINGFIELD, ILL.—An electric railway is to be constructed to connect Pekin and Peoria.

BRISTOL, PA.—Petitions are being signed by property owners from Torresdale to Bristol for the Holmesburg and Bristol Trolley Company to be extended to this place.

OAKDALE, L. I.—New York capital has been pledged for the construction of a trolley line from this place to the western boundary of Islip. The franchise has already been secured, and the road must be completed in two years.

## Electric Light and Power.

GOUVERNEUR, N. Y.—A new electric light company is about to be organized here to compete with the Oswegathchie Light and Power company, which now controls the electric lighting system of the city.

LINCOLN, ILL.—Logan County Electric Light Company has been incorporated by John W. Lutz, Charles C. Reed, John St. Gerny, T. A. Reynolds, Adam Denger, D. H. Harts, R. H. Cains and John A. Lutz to operate an electric light plant. Capital stock, $10,000.

EGG HARBOR CITY, N. J.—The Philadelphia Electric Light and Water Company has been organized. Henry Keuhnle is the president. The company will begin the erection of a new plant in three weeks.

WHITE RIVER JUNCTION, VT.—An effort is being made to raise funds by subscription to put in a system of electric street lights.

SHELBYVILLE, IND.—The Shelbyville electric light and waterworks plants were sold by order of the United States Court. The bid was $75,000. The plants were bonded for $286,000.

MILWAUKEE, WIS.—The Barlin Electric Light and Power Company offers to sell its plant to the city for $20,000, to be paid for in 10 annual installments of $2,000 each, without interest. The plant is to be turned over to the city as soon as a sale is made.

BLUE EARTH CITY, MINN.—The Common Council has entered into a contract to purchase the entire electric light plant and all appurtenances of O. J. Clark, who now has the franchise.

DAMARISCOTTA, ME.—The Vergennes Electric Light Company will soon increase its power in order to fully accommodate the public with more lights.

DURAND, MICH.—Citizens of this place will vote on the question of bonding the village for $10,000 to put in an electric light plant.

MENASHA, WIS.—The contract for lighting the city by electricity has been awarded to the Neenah & Menasha Gas and Electric Company.

LITTLE ROCK, ARK.—Mr. George Eckoff will put in an electric plant on his property.

TOLEDO, ILL.—Steps are being taken to establish an electric light plant.

BALLSTON, N. Y.—The Ballston Electric Light and Power Company have elected H. J. Donaldson, president; S. C. Medbery, vice-president, and H. C. Wescot, secretary.

THIEF RIVER FALLS, MINN.—The F. H. Kratka Land, Water Power and Improvement Company has been incorporated. The incorporators are ex-Mayor F. H. Kratka, of this city; Geo. W. Mason, Eau Claire, Wis.; Wm. S. Jamieson, St. Paul; Jas. A. Kellogg, Minneapolis, and Lewis P. Johnson, banker, of this city, and their place of business will be Thief River Falls, Minn.

KALAMAZOO, MICH.—The spring and axle company will put in a large electric plant at once. The Clarage Electric Company has been awarded the contract for the dynamo and Henry B. Desenburg for the wiring.

LINCOLN, ILL.—Logan County Electric Light Company has been incorporated. Capital stock, $10,000. Incorporators, John W. Lutz, Charles C. Reed, John St. Cerny, T. A. Reynolds, Adam Denger, D. H. Harts, R. H. Gains and John A. Lutz.

AMESBURY, MASS.—The electric light company is to add a new 1,000-light dynamo to its plant.

CONCORD, N. H.—J. G. Batterson, Jr., has made a contract with the Concord Land and Water Power Company to supply electricity both for light and power at the works of the New England Granite Company. Orders for motors have been placed and the work of installation will be completed at the earliest possible moment.

THERESA, N. Y.—Stockwell & Parker have rented the electric light plant here of Mr. Reynolds for a term of three years.

RIVERPOINT, R. I.—Electric light company will extend its lines.

BROWNVILLE, ME.—An electric light plant will be put in the peg factory and will be used for lighting the streets.

HEYWORTH, ILL.—J. L. Humphrey's electric light plant was destroyed by fire.

UNIONVILLE, KAS.—Steps are being taken to establish an electric light plant.

HARTFORD, CONN.—The Hartford Electric Light Company has been awarded the contract for establishing an electric light plant at the jail.

NIAGARA FALLS, N. Y.—The Acetylane Gas Company are erecting a new $30,000 building and have closed a contract with the Niagara Falls Power Company for 3,000 horse-power. The contract for the electrical machinery will be let in a few days.

ATLANTA, IND.—The Atlanta Steel and Tin Plate Company are in the market for a complete electrical equipment. They will put in a 50-arc light plant complete.

SAC CITY, IOWA.—Sac City Electric Company has been incorporated by D. C. Early, Asa Platt, D. E. Hallett, E. N. Bailey, J. E. Robbins, W. Cheney and J. Y. Campfield. Capital stock, $15,000.

DENVER, COLO.—Machine Electric Light and Power Company has been incorporated by J. S. Spencer, F. D. Taggart, H. J. Mayhan. Capital stock, $100,000.

## New Telephone and Telegraph Companies.

BRIDGEPORT, CONN.—A branch of the Norwalk Mutual Telephone Company has been organized here. Branches will be formed in all parts of the State.

PATERSON, N. J.—The Home Telephone Company has filed its certificate of incorporation. The company will build telegraph and telephone lines in Passaic County. The stockholders are Ernest J. Foord, Jersey City; P. Justus Atkinson, New York, and George W. Atkinson, Newark. The capital stock is $300,000, and the company will start business on $100,000.

SYCAMORE, ILL. — The DeKalb County Telephone Company, having completed a local telephone exchange in Sycamore, will extend its lines south to Sandwich, through Cortlandt and Hinckley, also north to Geneva and Kingston, where the Belvidere line will also be extended, thus connecting three county seats, Rockford, Belvidere and Sycamore.

HAGERSTOWN, MD.—A new long-distance telephone line will be built from this place to Leitersburg, Cavetown, Md. and Waynesboro, Pa.

CAMDEN, N. J.—A new building for the Camden Telephone Exchange is to be erected.

OBERLIN, OHIO.—The Postal Telegraph Company has changed its name to the Oberlin Telegraph Company.

ALBANY, N. Y.—The North Creek, Newcomb & Long Lake Telephone Company, Limited, has been incorporated to build and operate a telephone line from North Creek in a northeasterly course by way of Olmstedville to Kellogg's, in the town of Minerva, thence by way of Aiden Lair north to Newcomb and Long Lake, connecting North Creek, Olmstedville, Minerva, Aiden Lair, Newcomb and Long Lake. The capital stock is $3,000. Directors for the first year are John Anderson, Jr., Dennis Moynehan, Jr., and Edward Anderson, of Newcomb; P. Moynehan, of Glens Falls; David Hunter, of Tahawus; John Donelly, of Olmstedville, and T. D. Sullivan, of Long Lake.

CAPE MAY, N. J.—Government Telephone Expert William Bolton is here completing a survey for a telephone circuit from South Atlantic to Cape May Point, connecting all the life-saving stations. The building of this line will connect by telephone all the life-saving stations on the Atlantic coast from south of Cape Hatteras to Maine.

ALBANY, N. Y.—The Beaver Hill Telephone Company has been incorporated to connect Rockland Station and Lewbeach, in Sullivan County, and to connect such lines with points in Sullivan, Ulster and Delaware counties. Capital, $1,500. Directors, Jefferson Campbell, of Roscoe; J. W. Johnston, of Rockland; Jay Davidson, of Beaver Hill, and others.

## New Manufacturing Companies.

CLEVELAND, OHIO.—Union Power Company has been incorporated. Capital stock, $50,000.

NEW YORK, N. Y.—Smith-Vassar Telephone Company has been incorporated to manufacture telephone and telegraph instruments and apparatus and electrical devices in New York city. Capital, $1,000,000. Directors, W. L. Beardsley, Frederick J. Winster, Joseph F. Darling, Augustus N. Hand, Charles W. Dorland and Edward Schmidt, of New York city, and Frank S. Pusey, of Council Bluffs.

PHILADELPHIA, PA.—The Philadelphia Electric Storage Battery Renting Company has been incorporated. Capital, $300,000.

STAMFORD, CONN.—The Mason Electric Company is the name of a new firm which has commenced business with Mackensie MacArthur, at 61 Orange street. The new firm will engage in all kinds of electrical contracting, etc.

## Business Troubles.

SCHUYLKILL, PA.—Deputy Sheriff Henning has received an attachment for $25,000 against the Schuylkill Electric Railway Company of Pennsylvania in favor of Anthony F. Holahan.

## THE MANUFACTURE OF CARBORUNDUM.

AN INTERESTING PLANT AT NIAGARA FALLS.

In the ELECTRICAL REVIEW for October 23 there appeared an account of the successful transmission of current on October 19 from the station of the Niagara Falls Power Company to the works of the Carborundum Company at Niagara Falls, N. Y. Herewith is presented an account of the process of manufacturing carborundum.

The various buildings and apartments of this superb plant are admirably arranged for the economical handling and manipulation of the materials. The stock building, into which are received the crude materials, is provided with a railway track connecting with the Niagara Junction Railroad, on which the loaded cars are conveyed to the various bins or compartments provided for the reception of the crude materials, which consist of coke from the Pennsylvania bituminous coal fields, white sand from Ohio, salt from the salt works of New York State and sawdust from the mills of Tonawanda. Conveniently arranged in relation to the storage bins of crude materials is a most complete grinding, grading and mixing plant, into which the coke, as it comes from the cars, is introduced and ground and sifted into assorted sized grains and conveyed into bins, from which it is drawn and mixed in proper proportion, with measured quantities of sand, salt and sawdust, and these measured quantities thoroughly mixed and delivered in a bin provided for the finished mixture. This work is done by automatic machinery at the least expenditure of manual labor.

The four crude materials having been prepared into what is called "the mixture," they are conveyed to the electrical furnaces situated in an adjoining building. It would perhaps be difficult for one unskilled in the arts of the electro-metallurgist and unfamiliar with the apparatus he employs in producing his transformations to recognize the rough and apparently crude oblong brick boxes, made without cement, mortar or other binding materials, as furnaces. Provision is made for five of these boxes extending down one side of the large, spacious building, each of them measuring about 15 feet in length by seven feet in width and the same in height. In the center of each end is placed a large bronze plate and these are connected by means of four large copper cables to massive copper bars extending under the floor at either end of the furnaces. Connecting with the inner surfaces of the bronze plates are 120 carbon rods, 60 to each plate. These carbon rods are three inches in diameter and something over two feet in length, and are so placed as to pass through the end walls of the brick box or furnace, projecting into the interior and towards each other, thus constituting what are known as terminals. Into this rectangular brick box the mixture that has been prepared in the stock room is introduced, about 10 tons constituting a charge, and through the center of the mass of mixed materials is placed a core or cylinder of granules or crushed coke extending from the carbon rods at one end of the furnace to those at the other end, and making a perfect electrical connection through the furnace by means of the bronze plates, carbon rods and the core.

The furnace, as now described, is prepared for the turning on of the electrical current and this is provided for and controlled in the adjoining building, which was specially constructed for the transforming apparatus used in reducing the high pressure current as received from the dynamos of the power company to the low pressure current used in the electric furnaces. Located in the same building is the regulating apparatus used in controlling the current as it passes to the furnaces. The transformer and regulator contained in this building are the largest that have ever been built, and the regulator is of exceedingly novel and ingenious construction, absolutely controlling a current of 1,000 horse-power.

When everything has been properly prepared, the connections to the furnace completed and the signal given, 1,000 horse-power of electric current is turned into the granular core already referred to and kept on for 24 consecutive hours, making a total expenditure of energy of 24,000 horse-power hours. All of this vast amount of energy is transmitted to the core—21 inches in diameter and about nine feet long—and within its mass it is converted or transformed from electrical to heat energy—an amazing amount of work to be performed in so limited a space.

A short time, perhaps two hours, after the turning on of the current, gases began to escape through the crevices of the brick walls of the furnace, and, being ignited, they burn with a lambent blue flame. As the process continued, the outer walls and top of the mass in the furnace showed a slow rise in temperature, the effect of the transmission of the immense heat from the core, the entire top of the mass becoming red hot in about 12 hours. After the current has remained on for the period of 24 hours, or until such time as the workman in charge recognizes that it has been properly operated, the current is stopped in the transformer building, the flexible cables are disconnected from the bronze plates and others are connected with the plates of the next furnace in the series of five, and it in turn is carried through the same operation.

One end of the furnace is removed and a cross section through its center exposed, thus permitting of a ready inspection of the results of the operation. In the center is the granular core, in the same position in which it was originally placed, but it is now purified of all foreign substances. It is now pure carbon, and has lost about one-fourth of its weight, this loss representing the volatilized impurities. The presence of grains of graphite disseminated throughout its mass indicates that its temperature must have been near 7,000 degrees, which is the point of graphite formation. Surrounding the core, in the form of a cylinder, is a beautiful crystalline formation, the crystals being constructed on lines radiating from the center. Those crystals in the immediate contact with the core are looped or built together into one concrete mass, this solid formation giving way to a loose structure as the distance from the core is increased; the size of the crystals, at the same time, diminish rapidly, until at about 15 inches all crystallization ceases and is followed by an amorphous material, of a whitish gray color for a distance of about two inches, when a sudden change occurs to a black mass composed of the original mixture, now held together in a cemented state by the fusion of the salt.

The crystalline and amorphous material lying between the core and the outer black mass is carbide of silicon, being composed of carbon and silicon, atom to atom. It is this material that was discovered by Mr. Acheson and by him called carborundum.

About two tons of carborundum are produced in one furnace run, and to prepare it for the market it is first passed under heavy iron rolls, for the purpose of crushing apart and separating the individual crystals, after which it is treated with an acid and water bath to remove solubles. It is then dried and sifted, to separate the various sized grains, which are indicated by the number of threads per inch in the sieve through which they pass, and are placed in bins ready for packing for shipment, or to be worked up into wheels, hones or other forms in which abrasives are used.


INDUCTION COILS.

MAGNET SPOOLS.

For Arc Lamps, Telephones, Telegraph Apparatus, Electric Bells, Annunciators and Electric Motors.

C. F. SPLITDORF, Manufacturer, 17-27 Vandewater St., N. Y.

FINE WIRE WINDING OF EVERY DESCRIPTION.

MESCO DRY BATTERY.

*A standard battery for all open circuit or intermittent work. Highly recommended for Telephone Transmitters.*

OVER 230,000 SOLD DURING THE PAST YEAR.

*For sale by nearly all the Electrical Supply Houses in the United States.*

*GIVE IT A SEVERE TEST. Unreliable Dry Batteries are not sold much cheaper than the MESCO.*

64-PAGE PAMPHLET FREE. Catalogue, 208 pages, 10 cts.

MANHATTAN ELECTRICAL SUPPLY CO.,

32 Cortlandt Street, New York.

MEDBERY INSULATION AND

*ALUMINUM BRONZE OVERHEAD TROLLEY EQUIPMENT FOR*

Best in the World. ELECTRIC RAILWAYS.

MEDBERY SWITCHES OF ALL KINDS.

*QUICK AND SLOW BRAKE.*

New York.
Philadelphia.
Chicago.
San Francisco.

"PONY" Switch.
15, 25 and 35 Amp.

THE FIBERITE CO.,
Mechanicville, N. Y.

AGENCIES:

*ELECTRIC APPLIANCE CO.,* CHICAGO, ILL.

*PETTINGELL-ANDREWS CO.,* BOSTON, MASS.

*ELECTRICAL ENGINEERING CO.* MINNEAPOLIS, MINN.

*ST. LOUIS ELECT'L SUPPLY CO.,* ST. LOUIS, MO.

*BRADFORD BELTING CO.,* CINCINNATI, O.

PHILLIPS INSULATED WIRE CO.,

NEW YORK OFFICE: 39 & 41 Cortlandt Street.

FACTORY: PAWTUCKET, R. I.

TO OUR FRIENDS:

After a CONTINUOUS RUN, excluding Sundays, of a thousand hours, we have almost caught up with our orders, which since our fire have been nearly twice as large as ever before.

We have also nearly replaced our stock of parts and are therefore able to serve our customers with greater promptness than has recently been possible.

Yours very truly,

CROCKER-WHEELER ELECTRIC CO.,

39 CORTLANDT ST., NEW YORK. S. S. WHEELER, *President.*

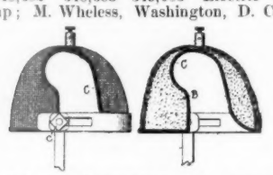
# ELECTRICAL PATENTS

ISSUED OCTOBER 29, 1895.

548,627 Electric traction; E. Chabeault, Marseilles, France.—An electric railway, current furnishers, including contacts, a bell-shaped cover, perforated rod, piston and cylinder in which the same moves.

548,669 Insulator pin; C. W. Stephen, Camden, N. J.

548,682 548,683 549,083 Electric arc lamp; M. Wheless, Washington, D. C.—



No. 548,777.—ELECTRODE FOR APPLYING ELECTRIC CURRENTS.

A positive carbon holder provided with slots, binding cams, plates for holding such cams to the carbon holder and a clamp for limiting the upward movement of the plates.

548,684 Dynamo electric machine; N. Whichello, Chicago, Ill.

548,700 Electric recording apparatus; A. C. Crehore, Hanover, N. H.—Consists of apparatus for polarizing a beam of light, of a medium interposed in said beam and acting in a magnetic field to rotate the plane of polarization, an electric circuit for controlling the magnetic field, means for breaking and making the circuit, and photographic apparatus for producing a clearly defined record of the interruptions in the beam of light, and thereby of the breaks in the electric circuit.

548,701 Indicator for electric currents; A. C. Crehore, Hanover, N. H.

548,709 Polyphase alternating current motor; F. S. Hunting, Fort Wayne, Ind.—An alternating current induction motor having a primary winding and a polyphase secondary winding, the coils for each branch of the latter being sectional and distributed on the core so that the secondary electro-motive forces in the several sections of a branch will be in the same phase.

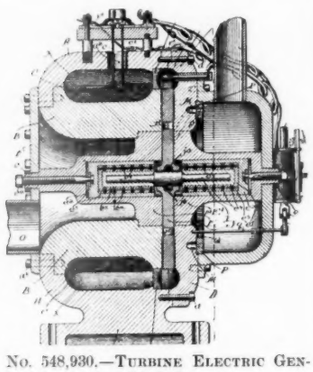
548,729 Telautograph; G. S. Tiffany, Highland Park, Ill.

548,730 Dry battery; J. T. Todd, Tuscola, Ill.

548,733 Automatic cut-off mechanism; W. M. Williams, Opelika, Ala.

548,744 Electric switch; J. C. Cassidy, East Orange, N. J.

548,755 Electric meter; R. O. Hood, Danvers, Mass.—Consists of a coil in the circuit to be measured, a movable structure



No. 548,930.—TURBINE ELECTRIC GENERATOR.

acted upon by the dynamic action of said coil to move it, a device for intermittently retarding the speed of the structure when it has reached a definite velocity, and means for recording each retardation of the structure.

548,777 Electrode for applying electric currents; E. F. Davis, West Caton, N. Y.—An electrode for applying the electric current, having a conducting portion, a lining therefor of absorbent material, and an insulating covering around the edges of the conducting portion.

548,786 Underground electric railway; H. B. Nichols, Philadelphia, Pa.

548,789 Distribution system for alternating currents; A. L. Searles, Brooklyn, N. Y.—Comprises a plurality of transformers, a solenoid supplied by one transformer for opening or closing the circuit of another transformer at a predetermined lead, switch magnets controlling said opening or closure, and means for momentarily energizing one of said switch magnets when the solenoid is operated.

548,819 Electric switch; H. Ross, Providence, R. I.

548,829 Device for regulating current admitted to electric motors; F. E. Herdman, Winnetka, Ill.

548,830 Automatically controlled electric motors; F. E. Herdman, Winnetka, Ill.—An electric motor and a source of electric supply, an electric circuit from the source of current supply to the field of the motor, a resistance device in said circuit, a circuit to the field independent of the resistance device, a switch device controlled by the motor in said last-mentioned circuit.

548,867 Rheostat element; H. P. Davis, Pittsburgh, Pa.—Composed of a support, and disk strung thereon, some of said disks being provided with knobs for providing restricted contact.

548,897 Telephone switch; J. E. Thomas, Cleveland, Ohio.—Composed of a rotary reciprocating shaft hooked at one end and provided with a disk at the other, means for imparting the double motion thereto, and a receiver adapted to hang on the hooked end of said shaft.

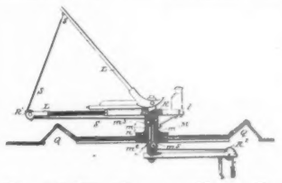
548,899 Adjustable incandescent lamp holder; E. Wade, Lawrence, Mass.

548,904 Automatic time cut-out; F. E. Badt, Chicago, Ill.

548,924 Electric train signal; M. W. Parrish, Detroit, Mich.

548,930 Turbine electric generator; C. E. Sargent, Chicago, Ill.—Composed of an armature provided with a series of vanes and suitable ports and supply pipes for delivering a gas at great velocity against the vanes and for receiving the discharge therefrom.

548,952 Electric brake; F. E. Case, Schenectady, N. Y.—A line circuit, motors



No. 548,997.—ELECTRIC MOTOR CAR TROLLEY.

operating an electrically propelled apparatus, mechanism adapted to open the line circuit, to shunt the field magnets of the motors, to reverse the motors and to include them in a local circuit.

548,969 Telegraph instrument; O. A. Dickinson, Arverne, N. Y.

548,976 Closed conduit electric railway; M. F. Flynn, Stamford, Conn.—A closed conduit, line wires therein and switches to engage the wires, striking cams on the conduit to operate the switches, cams having opposite arms, one of which is yielding.

548,997 Electric motor car trolley; J. M. Kennedy, Hollidaysburg, Pa.—A reversible overhead trolley and means for shifting the same and a light giving appliance carried by said trolley, adapted to throw the light upon said trolley.

549,023 Secondary battery plate and method of preparing it; J. J. Rooney, Brooklyn, N. Y.

549,035 Thermostat regulator; H. A. Tobey, Toledo, Ohio.

549,038 Electric Program clock; L. H. Watters, Media, Pa.

549,045 Electric burglar alarm; M. Anthony, Streator, Ill.

549,058 Photographic retoucher; J. N. Choate, Carlisle, Pa.

549,061 Indirect control of motors; G. S. Dunn, New York, N. Y.—A motor, means for supplying to the armature a constant current, and means for regulating the field independently of the armature.

549,074 549,075 Electric arc lamp; R. Niewerth, Berlin, Germany.

549,079 Secondary battery, grid and plate and method of preparing grids; J. J. Rooney, Brooklyn, N. Y.—A grid composed of paper which is perforated and then distended and coated with vulcanized rubber.

549,091 Trolley for electric railways; J. Hess, Scranton, Pa.


**PATENTS.**

TRADE MARKS.—DESIGNS.—COPYRIGHTS.

**CAN YOU OBTAIN A PATENT?**

Send me a model or drawing of your invention, and a description, and I will examine same and advise you promptly. My fees are moderate in all Patent matters, and I can obtain a Patent in the shortest possible time.

All Patents taken out through me are given special notice in the leading journals of the country, thus bringing same widely before the public without cost to inventor.

REFERENCES: "Electrical Review," New York; Paul Cromlein, Teller Lincoln National Bank, Washington, D. C.; Judge Geo. D. Parker, Berkley, Va.; Second National Bank, Washington, D. C.; E. K. Leech, U. S. Mint, Philadelphia, Pa.; W. F. Newell, Manager and Secretary Water Works, Olympia, Oregon.

**EDW. S. DUVALL, JR.,** Solicitor of Patents. Loan and Trust Bldg., WASHINGTON, D. C.

**ELECTRICITY**

*Mechanical and Architectural Drawing, Steam Engineering (Stationary, Marine, Locomotive), Plumbing, Heating, Civil Engineering, Coal and Metal Mining, English Branches,*

**TAUGHT BY MAIL.**

Twenty-seven Courses of Study. Send for *free* circular. State subject you wish to study,

The International Correspondence Schools, SCRANTON, PA.

**DYER & DRISCOLL,**

Patent Solicitors, 36 Wall Street, N. Y.

have done all my patent soliciting work, both for this and foreign countries, continuously for the past fourteen years.

Thomas A. Edison

**Electrical**

AND ALSO

**Steam and other Engineering Branches**

INSTRUCTIONS BY MAIL.

**The Correspondence School of Technology,**

New Catalogue. Note Instructors. CLEVELAND, OHIO.

ESTABLISHED 1867

**PARTRICK & CARTER CO.**

**ELECTRICAL SUPPLIES**

125 South 2d St. Philadelphia

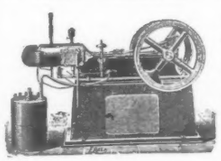
CATALOGUES ON APPLICATION

*Send Business Card and Mention ELECTRICAL REVIEW.*

**ELECTRIC CAR HEATERS.**

Railroad Companies desiring to equip their cars with Electric Heaters, by addressing the Hencken Electric Heating Company, 621 Broadway, New York City, will have the fact demonstrated to them that street cars may be heated by the consumption of only three amperes on a 500-volt circuit. We will upon application equip an experimental car at our own expense.

**PATENT RIGHTS FOR SALE**



of the best gas or gasoline engine ever made. Simple in design, smallest for brake horsepower. Impulse with each revolution. Cheap to build and operate. Will run equally well with either gas or gasoline without alteration. Engine may be seen in operation at office of

A. L. BOGART, 22 Union Square, New York City.

THIS SPACE RESERVED

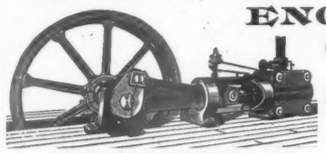
FOR THE

CROWN WOVEN WIRE BRUSH COMPANY,

SALEM, MASS.

**THE LANE & BODLEY CO.,** CINCINNATI, OHIO.

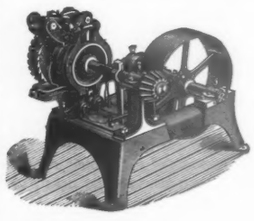
**ENGINES.**



**Corliss Engines a Specialty.**

Slide Valve Engines, Shafting, Hanger, Pulleys, Elevators, Saw Mills.

COMPLETE POWER EQUIPMENT.



MARK A. REPLOGLE, Chief Engineer.

**WATER-POWER**

GOVERNED FOR ELECTRICAL WORK.

The limit of government of water-power is often determined by the design and construction of plant. Consult us if possible before completing your plans.

With **REPLOGLE'S COMPOUND REGULATORS** we are prepared to undertake and guarantee the government of water-power for all purposes, including **Electric Railway, Power and Lighting Plants.** We make and sell all of Replogle's Electrical and Mechanical Governors and other devices for the government of water-power. Expert advice furnished on application. If results of your present system are not satisfactory, write us. Address all inquiries to

**THE REPLOGLE GOVERNOR WORKS, Akron, Ohio.**